ELECTRICAL REVIEW

April 4, 1947

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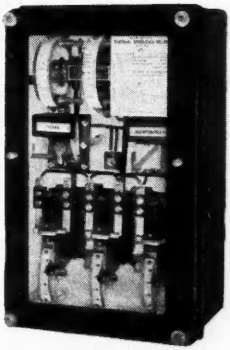

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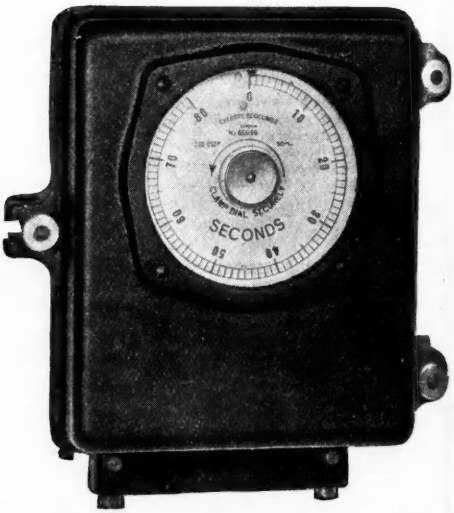

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ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

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Plant for Export

British Manufacturers' All-Embracing Scope

THE outstanding feature of a year of unprecedented activity among electrical manufacturers has been the large proportion of work for overseas markets. Some idea of their unstinted co-operation in the national export drive will be gained from the series of "progress" articles which have appeared in this journal. The meagreness of our paper ration has never been more apparent than when attempting to do justice to their achievements in the face of difficulties arising out of uncertainty as to supplies and prices of materials and shortage and unbalance in the grades of labour.

The British manufacturers' range of products collectively and in some cases individually covers practically the whole field of electrical engineering, but reference is possible only to some of the more notable items with emphasis on heavier plant for immediate export. Little can be said of the research developments now coming to fruition, the influence of which will in due course become apparent.

High Outputs and Voltages

The selection of examples of greatest individual output or highest voltage, for instance, not only presents the clearest indication of technical advance but also an *a fortiori* argument, in the circumstances, of an ability to produce successfully apparatus of a more conventional type, which is responsible for the large bulk of the output. It should be mentioned, however, that insulation to withstand tropical conditions has received especial attention.

Regarding generation, 50,000-kW 3,000-r.p.m. turbo-alternators to operate at 1,200 lb per sq in. and 925 deg F are on order. No doubt when the 60,000-kW two-pole alternators now under construction for installation in this country have justified themselves some of their successors on the test bed will find a home in the larger cities abroad, just as 33-kV stators, originated here, have become common practice all over the world. Similarly, no doubt, the gas turbines now being applied here to marine and railway propulsion will find scope for many purposes overseas.

Water-Power Plant

Water turbines and alternators have long been sent to countries richer in water power resources, and the experience so gained by manufacturers is now being turned to more extensive local account in the units under construction for the Highlands of Scotland. In like manner our manufacturers' part in the electrification of railways in many lands has placed them well for coping with the future conversion of our own main lines. Another field of transport in which a fundamentally British development gains ground is illustrated by the large number of trolley-buses dispatched. For smaller generating schemes, often in remote places where reliability is essential, oil engines continue to be in great demand.

The statement of one company that about one-third of its transformer output is for export is typical: units of up to 65,000 kVA wound for above 220 kV have been shipped. Orders for air-blast switch-

gear from abroad for voltages of this order is probably the most striking feature in this branch, but the claims of the well-established oil-immersed designs continue to be fully recognized by purchasers. Of the industrial plant supplied, mention can only be made of equipment and control devices for practically every kind of mill and of an unprecedented demand for motors of all powers. Quantitative values of electrical exports during 1946 and the countries of their consignment were given in our issue of January 31st. Qualitatively, the manner in which these orders (many of them repeat orders) are being fulfilled may be trusted to advance British prestige generally.

Fuel Restrictions

MR. ATTLEE'S pronouncement last week on the fuel situation was depressing and gave little hope of real improvement. Domestic and non-industrial electricity consumers are still to be restricted and it is poor consolation that, at last, equal treatment is to be accorded users of gas. The Prime Minister placed greater accent on restriction than on production, expressing doubt whether the output " target " for the next six months would be attained. The Trades Union Congress and many industrialists already consider that this target is too small. Negative comfort may be gained from the Government's realization that the rationing of gas and electricity is not feasible—a view which we have always held.

Men and Materials

" TOP priority " is to be accorded to the production of electrical generating plant according to recent Government statements. It is evident from Sir George Nelson's speech at last week's meeting of the English Electric Co. that so far the industry has had to take its chance in the general scramble for labour and materials. Sir George said that his company needed several thousand more men and had been able to recruit only 300. The result of this and the company's inability to secure essential materials has been to tie up capital and factory space, increase overhead charges and reduce the output per head. One of the first tasks of Sir Edwin Plowden, head of the new planning organization, must be to see that this vital industry is better treated.

Industrial Generating Plant

THE extent to which the electricity supply policy of encouraging the elimination of private generation is now being reversed is illustrated by the plan of Associated British Oil Engines, Ltd., for producing 1,500 55-kW Diesel-driven generating sets by the end of this year. The scheme has the blessing of the Ministry of Supply which has seen to the allocation of materials and seeks a voice in the disposal of the sets. The need for such a deviation from the trends hitherto followed is doubly regrettable. First, the loss of output and diversity of demand which it implies is reflected in the costs of the supply undertakings to the detriment of other consumers. Secondly, these sets or their equivalents in man-power and materials could presumably have been exported.

Independent Power Stations

WHILE the building of small generating sets for home use diverts a disproportionate amount (per kW of capacity) of manufacturing resources that could be devoted to the production of large units, which alone can provide a permanent solution of the power plant problem, this is by no means the end of the matter. Limitations of generating plant capacity in works discourage further electrification and very often the change-over of drives and processes to electricity are postponed unless the increase in demand is of such dimensions as to justify a major power-plant extension, which is not undertaken lightly. Mains supply, on the other hand, normally provides an inexhaustible reservoir of power on tap.

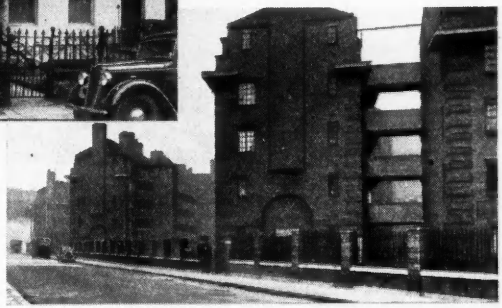
D.C. Fluorescent Lamps

THE use of fluorescent lamps on d.c. circuits, as suggested in our Correspondence section, should be restricted to special instances. The choke, which gives the voltage surge required for starting, does not limit current flow as with a.c. and the series resistance, necessary instead, halves the efficiency. Automatic starting is not so reliable and another drawback is that the light from the positive end falls off rapidly and entails arrangements for frequent reversals of polarity. The condenser, for correcting power factor is, of course, omitted.

London Load Building

IV—Service in the Domestic Field

FOLLOWING the first two articles of this series in the *Electrical Review* of January 3rd and January 24th, in which we outlined from the load-building point of view the "production" and "wholesaling" of electricity for a large section of the London Area, we published in our issue of February 7th an account, from the same angle, of how electricity is distributed from the bulk-supply points to the consumers in a part of the larger area first mentioned, namely, the smaller district supplied by the Central London Electricity, Ltd. In this and the next, final, article of the series we propose to deal with the handling of supplies at the consumers' end in this smaller area in the domestic and commercial fields respectively.



A typical example of the electrification of some of London's period houses (17, Edwardes Square) now 21 kW. Tachbrook estate (right) represents the lower-income level; 180 flats, 850 kW

The C.L.E. area, which was defined in the preceding distribution article, covers about 8 sq miles, and it probably represents the greatest load density in the world, except, perhaps, for the centre of New York. Despite a very considerable amount of overlapping throughout the whole of the area this may be broadly classified as consisting of three districts, one in the east representing commercial London, one in the centre where London entertains and accommodates its visitors, and one in the west where the Londoner and his family live. These three districts constitute the heart of London, and it is essentially the very heart of London with which we are dealing, and not Greater London in any way, for from every point of view, and particularly that of electricity supply, the characteristics of the heart of London differ tremendously from those of the suburbs and outlying districts. The area in question also differs widely from the area served by any other supply

An ambitious conversion scheme is projected at Eaton Square ; the present 100 private houses will accommodate 350 families

undertaking, at any rate, in this country, and from this aspect we need only point to its population.

It would not be wise to refer to a permanent population figure in the same sense as would be the case for any provincial town, because the permanent population of the area under consideration must be a comparatively small proportion of the daytime population by virtue of the very large morning influx of workers who fill the offices each day and of the large numbers of visitors who are continually coming and going from and to all parts of the country, and indeed of the world. What is this daytime population ? At the best an answer can be little more than speculation, but with a knowledge of certain statistics such as available accommodation and the numbers using the transport system one can arrive at a very rough estimate of about one million.

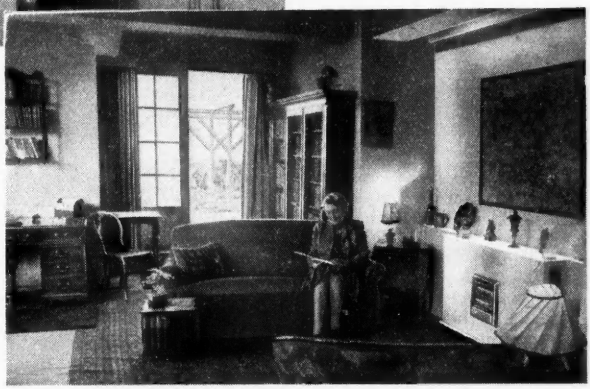
Thackery Court (30 flats, 325 kW) has replaced a row of old cottages like those shown on left

These characteristics create unusual problems of electricity supply, and over and above these there are the special difficulties of to-day, some of which are common to all electricity supply undertakings, while some are peculiar to the heart of London. Working to the limits dictated by plant and coal shortages, the difficulties of getting materials, and the post-war demands for electricity, particularly for space heating, are representative examples of the common problems, while outstanding ones peculiar to Central London are those arising from the sudden inrush of people into the area since the end of the war in Europe, certainly representing a few hundred thousand additional travellers every day and something like 20,000 additional consumers to the undertaking. The total number of consumers is now in the neighbourhood of 90,000, which has grown from 60,000 in 1941, to which latter figure the total consumers had fallen from 87,000 in 1939 as the result of wartime evacuation.

The object of any of our load-building articles, however, is not to deal with the peculiar problems and difficulties of to-day, which by themselves tend to create conditions inimical to load-building, but to look past these difficulties to the time when the threads of progress can be picked up again. Perhaps the most outstanding load-building difficulty peculiar to the heart of London at all times, and no doubt emphasized at the present time, is that

relating to the continuous movements of consumers, both to and from the area and within the area itself, to the extent of a change of 30,000 consumers per annum, which is equivalent to a 100 per cent turnover of the undertaking's consumers in three years.

Another factor of great influence on the load-building activities in the area, and one which is very favourable in normal times, is that Londoners generally are fairly electrically minded. A further point of special significance is that pertaining to the number of consumers, in that the figure of 90,000, by



The all-electric kitchens at Dolphin Square are particularly well laid out. Striking interior lighting in the Dolphin Square flats (right)

itself, bears no relationship whatever to the load or the load-building efforts in the domestic field, because the vast majority of the residents in London proper live in flats, and a large proportion of the flats is contained in large and sometimes colossal buildings, some of which represent to the undertaking individual consumers, although the number of homes served within each building may represent up to 1,000 or so consumers in a district where one has under consideration private houses in which, generally speaking, one family only resides in each.

It is possible to classify various types of loads as follows: Space heating 273,000 kW, lighting 161,000 kW, power 107,000 kW, cooking 88,000 kW, and water heating 21,000 kW. In conjunction with a total connected-load figure of about 650,000 kW it should be stated that the overall annual output of the undertaking is of the order of 450 million kWh, and that the average annual increase is from 30 to 50 million kWh. In 1945 the maximum demand was 149,300 kW, so that the load factor for that year was about 32 per cent. Of the 90,000 direct consumers about 54,000 are in the domestic field, although of the total connected load of about 650,000 kW something in the region of 290,000 kW represents the domestic load.

Perhaps the best indication of how the domestic position lies from the load-building angle may be given by the following saturation figures of one in five for cooking and one in seventeen for water heating, but to this we should add that the undertaking is of the opinion that summer water heating may become a more firmly established load as soon as conditions permit, and preparations have been made for this when the necessary apparatus becomes available.

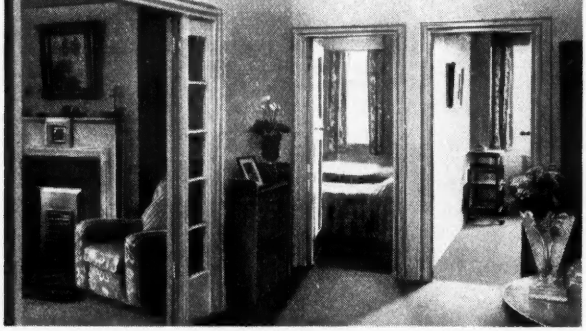
We have already indicated that the domestic load is concentrated mainly in the western part of the undertaking's area, which includes the City of Westminster, the Borough of

Chelsea, and portions of the Royal Borough of Kensington and of the Borough of Holborn. How is the load obtained in this district? We should say that the first point in the necessarily complex answer to this is the fundamental principle of catering for all income levels, for in the area under survey there is probably a greater diversity of individual incomes than can be found in any other place. If any preference is given to any one income level it is certainly the lowest income group, and in this connection we would point to the fact that under special development schemes begun in 1934 more than 5,000 consumers in the Pimlico area use electricity for all purposes.

In the second place of importance we should rank the simplification of tariffs, there being only two of these, two-part and flat rate, and at the moment there are about 30,000 consumers on the two-part tariff. A high place in the load-building efforts must be given to the close contact maintained with the architects, builders, landlords and estate agents in or interested in the area, and in this connection we would mention a system for obtaining information on all projected work within the area and the systematic recording of information relating to consumers' premises which extends to details of all apparatus used, including non-electrical equipment.

Then there is the close co-operation with the local authorities which has a special significance at the moment in view of the rehousing work which is going on or is projected. Showroom facilities form another important plank in the load-building platform. There are five showrooms and two commercial sub-offices in the area through which pass about 120,000 consumers and prospective consumers every year, and in which unbiased advice can be obtained on any electrical problem, be it heating, lighting, cooking or water heating. Architects, builders, etc., can also obtain free technical advice from these showrooms, where there are, in normal times, stocks of every type of apparatus, selected particularly in the consumers' interest.

Hire and hire-purchase facilities also encourage the consumer, and at the present time there are about 14,000 cookers and 6,000 water-heaters on hire, but these figures do not bear a true relationship to the load-building efforts because the supplies of such equipment are necessarily very restricted at the present time. Great importance is attached to the provision by landlords of adequate wiring for all future developments, and in connection with this designs are already waiting for permanent post-war projects.



Entrance hall to one of the Chatsworth Court "luxury" flats

For a long time an outstanding general development in the domestic field of London has been the conversion of large houses into flats, sometimes by a rearrangement of the interior partition walls of the building. This development has a particular significance at the present time, because it constitutes the principal method of tackling rehousing in the early stages. The importance of the development in the load-building efforts lies in the creation of several or many consumers where there was originally only one. An interesting example of this is the private house at 107, Warwick Way, which originally was occupied by a single consumer with a connected load of about 1 kW. Now the house comprises one flat and eight flatlets with a total connected load of 48 kW. Each of the single-room flatlets has a utility fire.

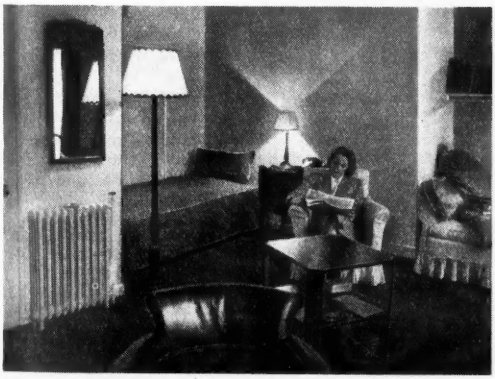
A much more ambitious conversion scheme is projected at Eaton Square and is directly

concerned with to-day's rehousing developments. In this notable West End residential district 100 private houses are to be converted during the next few years to provide accommodation for 350 families in medium-sized flats without destroying the architectural features of the buildings and the spacious layout of the avenue and the side roads. Access to the flats will be provided by means of a corridor right through each terrace of houses. Full facilities for the use of electricity will be provided, and the result of the conversion will be a connected load increase from about 1,000 kW to 4,000 kW.

Electrical development, however, has taken place in many private houses, as such, including some of London's interesting period houses set in the pleasant old London squares. A typical example is 17, Edwardes Square, a comparatively small house for the West End, which now has a connected load of 21 kW where previously electricity had been used for lighting only.

Kensington Close typifies the bachelor-flat development in the form of modern building blocks ; 554 single-room flats, 825 kW

We have mentioned how the undertaking caters for all income levels, and for convenience of presentation we will endeavour to classify the London flats, which have so marked an influence on the undertaking's load-building, in this way. The Tachbrook Estate in Pimlico represents the lower income-level consumers, and at present there are five building blocks with a total of 180 flats, representing a connected load of 850 kW. Although one solid-fuel fire is provided for in each of these flats, about 60 per cent of them are actually all-electric, and 46 of the flats are equipped with water heaters. These flats were built in 1933-34 on the site of the serious Thames floods and where the electrical load was previously negligible, and building has now commenced on new blocks which will extend the schemes to a total capacity of 357 flats, all with equal facilities for the use of electricity.



The bachelor flats at Kensington Close may be regarded as representative of the " middle-income " level

To attempt another classification—" middle class "—we would point to Thackery Court in Chelsea, a block of 30 flats which has replaced a row of old cottages. The flats are two- and three-room dwellings, and they are all-electric. Space heating is provided by means of fixed and portable fires throughout the flats and the consumption is paid for by the consumers. Water heating by means of a 20-gal. heater

in each flat is also a general service by the landlords, while all the flats are equipped with cookers hired from the undertaking and provision is made for refrigerators. The total connected load in Thackery Court is 325 kW. Finally there is the "luxury" flat, and in this connection we probably cannot do better than refer to Chatsworth Court, in which there are 189 flats, all using electricity for all purposes and having a total connected load of 1,800 kW.

Such a classification as we have just attempted cannot, of course, be more than indicative on the broadest possible lines, and there must necessarily be very considerable overlapping. Further there must be classifications from other angles if one is to see the development as a whole in its true perspective. Such a classification outside the income-level scheme is the single-room or bachelor flats which have been developed largely around Kensington and Chelsea. In some cases the development takes the form of modern blocks of flats, and in others the form of converted houses.

Originally a private house (2 kW), 25, Courtfield Gardens now has 84 single- and double-room flatlets

An example of the former is that of Kensington Close, which has been built on the site of a large house and its garden. With the exception of a solid-fuel central heating scheme, electricity is used exclusively in all the 554 single-room flats which, with the services in the swimming pool, restaurant, entrance lounge, etc., have a total connected load of 825 kW. Despite the overlapping to which we have referred, Kensington Close, within the limits set by its special purpose, i.e., bachelor flats, may be regarded as representing, at any rate, one of the higher income levels.

Within the same category we can also refer to 25, Courtfield Gardens as representing one of the lower income levels. This was originally a private house with a connected load of about 2 kW. It now comprises 84 single- and double-room flatlets, in which electricity is used for all purposes, except water heating (there being a solid-fuel hot-water service), and which have a total connected load of 425 kW.

Dolphin Square (see title block) may also be referred to outside our classification scheme, if only because of its size. It is claimed to be the largest enterprise of its kind in Europe. It comprises over 1,200 flats which house about 4,000 people, and it is self-contained with its own shops at the ground level, so that the whole is equivalent to a small township, which claim is supported by a spacious swimming pool, restaurants, snack bars, and so on. Electricity is used for heating, cooking and refrigeration in about 70 per cent of the flats, and we saw some striking examples of interior lighting in some of them. The extensive use of lifts in a building of this size renders this power load in the domestic field of outstanding importance.

We are indebted to Central London Electricity, Ltd., for permission to undertake the investigation for this article, and to Mr. W. E. Davies, commercial manager, and his staff, for their co-operation.

Batti-Wallahs' Society

THE chief guest at last week's luncheon of the Batti-Wallahs' Society was Mr. D. St. Julian-Bown, chairman of the British Display Association, who in a talk entitled "Britain Can Show It," gave some indication of the technique required in arranging displays and stressed the effects of successful displays upon sales, particularly in fostering the export market. The principal guest at this month's luncheon of the Society will be Miss Caroline Haslett, C.B.E.

Industrial Research

First F.B.I. Regional Conference

THE first of a series of regional conferences on "Industry and Research," organized by the Federation of British Industries was held on March 25th at Birmingham. The morning session was opened by Sir Ernest Canning (vice-president of the F.B.I.), who in urging increased production said that in two or three years' time the sellers' market would end and we should have a highly competitive struggle in the world's markets to secure the requisite imports for this country.

Sir William Larke (chairman of the F.B.I. Industrial Research Committee) said that what was needed more than ever in our history was a spirit of inquiry and the development of research-mindedness, as a national characteristic of our people. He believed that with the accumulated experience with which the nation started, present difficulties would be overcome, and we should once again wring prosperity out of adversity in achieving which industrial research in the broadest sense would prove the most potent influence.

Dr. J. W. Jenkin (president of the Institution of Metallurgists), said that the industries of the five Midland counties made a multitude of products that were probably greater in variety than those of any similar area in Great Britain. From the research point of view the Midland industries were based on mechanical and electrical engineering, metallurgy, physics and chemistry. Their research needs centred round the proper application of all of these branches of technology to the finding of the new thing, with emphasis on whichever science was most appropriate to the particular industry. The bridging of the gap between finding the new thing and its exploitation to commercial advantage—the development stage—ought not to be left only to the spare time activity of those whose primary job was to administer, produce and sell. Development in any industry covered raw materials, processes and products, and when combined with research could provide management with proposals that were practicable and economic as well as scientifically sound.

The afternoon session was opened by Sir Edward Appleton (secretary of the Department of Scientific and Industrial Research) who dealt with industrial research in the Midlands. Sir Edward said that science was a vast reservoir of organized knowledge accumulated from controlled and reproducible experiments. The first need of every industrial firm was that it should have a pipeline to this reservoir through which it could draw on the scientific knowledge available in Government laboratories, research associations and the universities and technical colleges. The most valuable support that could be given to industry lay in encouragement of co-operative action through research associations. Mr. F. G. W. King (technical director, Dunlop Rubber Co.), said that more attention should be given to the study of how to raise productivity considerably. This called for a skilled study of production engineering, and particularly of what was often called flow production. Mr. J. G. Pearce (director, British Cast Iron Research Association), suggested that the firm not large enough to provide one full-time or part-time technical man should use its co-operative research association as a source of information.

The Economic Position

A LENGTHY memorandum upon the Government's "Economic Survey for 1947" has been prepared by the Federation of British Industries. It comments on the allocation of labour and materials, coal production and consumption, transport, taxation and monetary policy, export and power supply. With regard to the last subject it is thought that resources for building and equipping power stations should be mobilized, guaranteed the necessary supplies and set a programme based upon a two-year construction interval. New designs should be deferred replicas, of existing stations being produced. The export of equipment needed for home use should be "critically examined" and the importation of plant from Germany should be considered. Arrangements for any necessary load shedding should be organized so that industrial undertakings might know when their turn was coming.

Joint Students' Meeting

THE first post-war joint meeting of the Students' Sections of the Institutions of Civil, Mechanical and Electrical Engineers was held on March 24th, in the I.E.E. Building. Three short papers on "Hydro-electric Power Schemes" were presented. Mr. A. O. H. Nielsen, M.A., opened by presenting an account of the work of the civil engineer in providing the dam, the several different types of which were dealt with comprehensively, the main power station building, and associated channels. Mr. P. J. Butcher continued by outlining the part played by the mechanical engineer, in designing and installing the turbine and Mr. C. G. Mabley concluded by describing briefly the characteristic features of the alternators employed and the usual switching and transmission arrangements.

Views on the News

Reflections on Current Topics

IN discussing the future of E.D.A., the leading article of March 28th pointed to the desirability of placing the propaganda emphasis on correct and efficient use of electrical appliances rather than on consumption of energy as such. That, indeed, is in line with the tradition of progressive supply undertakings, whose consumers' engineers are thereby differentiated from mere "current salesmen." Knowing something of the industries they have been instrumental in getting on to the mains, they have had opportunities of tactfully suggesting to works engineers how the kVA as well as the kWh can be minimized for doing the same amount of useful work. The immediate effect on revenue may be adverse, but experience has shown that this attitude pays handsomely in the long run.

* * *

As a background to one aspect of Lord Brabazon's pungent remarks at the E.D.A. luncheon, certain conclusions drawn by the Heyworth Committee of Enquiry into the Gas Industry (1945) are revealing. The Committee expressed the views that electricity could offer competition to gas in every field and that a considerable proportion of new housing would be electrified. Domestic uses accounted for 65 per cent of gas output, of which cooking provided the basic demand, but the Committee considered any increase in the latter as unlikely and that a decrease was possible. The gas industry is, of course, also threatened with nationalization.

* * *

The E.D.A. Memorandum on the Simon Report is criticized in *Smokeless Air* (the journal of the National Smoke Abatement Society) largely on the ground that electricity could not within any reasonable time take over the whole of the domestic heating load. Still less, it seems to me, could solid fuel, and the Simon Report did not claim as much. That Report advocated a policy of developing solid-fuel appliances which would burn smokelessly, at twice the present efficiency, the 50 million tons of bituminous fuel now used in domestic premises. It pointed out that the development of such appliances involved many difficult scientific and practical problems, apart from the heavy cost of installation, to be met by subsidies. Cost, it was suggested, could be minimized through mass production of standardized units, although the Egerton Report showed that the variety of coal types would make this difficult. The likelihood of the Simon Report being fully implemented, therefore, seems remote. On the other hand electrical appliances are now and have long been in the field, and coal is most efficiently burned in power stations, if indeed by that remote time much of it will be burned in the raw state.

* * *

To advocates of pit-head generation their case is so obvious that it scarcely needs arguing and yet as power engineers are very much aware there are other considerations than the proximity of coal. But where a power station is already being erected with these considerations in mind it is fortunate to find coal on or near the site. Such is the case at Meaford, near Stoke-on-Trent. Here it is proposed to mine coal and take it by conveyor to the station, cutting out rail transport. The new pit will cost between £2 and £3 million but the saving in transport charges is put at £150,000 a year, sufficient to repay the capital cost in twenty years. An ultimate annual output of 1,800,000 tons is anticipated; the station will consume 300,000 tons a year initially and about 1,000,000 tons eventually.

* * *

The use of fluorescent lighting for domestic premises in this country is still in its infancy, due principally to scarcity of tubes, the lack of smaller-length units and also the comparatively high initial cost. It is, however, interesting to study the present position in the United States where the more favourable conditions have already resulted in considerable progress in the application of this new form of lighting to the home. A survey published in *Electrical Merchandising* shows that rather more than 9 per cent of all homes visited had some fluorescent lighting. Nearly half of the owners of these homes plan to install more in the near future. Among those who now have no fluorescent lighting more than half plan kitchen installations and about 25 per cent would like this lighting in some other room also. —REFLECTOR.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

Billiard Table Lighting

WITH reference to the letters in your issues of March 7th and 14th, a test of fluorescent lighting that I made some years ago seems to confirm the opinions expressed by both Mr. Fletcher and Mr. Millar.

The stroboscopic effect mentioned by Mr. Fletcher is most apparent when the player is "addressing" a ball and also when the ball is striking and rebounding from the cushion, but this effect is mainly detrimental from the spectators' viewpoint thus bearing out Mr. Millar's point that during aiming and cueing the balls are stationary, and, therefore, the player is very little affected.

This form of lighting particularly with snooker, has the effect of enhancing the colour of the balls and makes these together with the green cloth most attractive. The objection raised to this particular job from the spectators caused a reversion to orthodox lighting.

It is quite true that in this particular case three-phase supply was not available and the stroboscopic effect, no doubt, would be reduced by using three fittings, one connected to each phase, but in my opinion sufficient of this would remain to condemn it from the spectators' point of view.

No doubt the ideal system of lighting a billiard table would be fluorescent lighting on a d.c. circuit, thus entirely eliminating the stroboscopic effect.

Leicester. J. G. EVERETT.

[This letter is commented upon in a leaderette. —*Editors, Electrical Review.*]

Needs of the Bee Farmer

DURING a recent holiday I came across an interesting example of electricity in the service of the bee farmer. The equipment employed includes a machine resembling a hydro-extractor, for extracting honey from the combs, which is driven by a ¼-H.P. motor. This eliminates a tremendous amount of manual labour. Twenty-eight frames of comb are fitted radially into grooved positions in the rotor and form one charge, the speed of rotation being high enough to cause the honey to be withdrawn centrifugally from the cells, after which it gravitates through strainers and is ready for packing. Cleanliness is essential and a 10-gal. electric washboiler provides hot water for general use and for the washing of cloths. Its special and most useful function, however, is the making of sugar syrup, which is used in large quantities for feeding the bees to safeguard them from starvation during the winter months.

An electric boiling ring is used to generate steam in a 1-gal. copper boiler for heating a hollow knife, which is used for stripping the wax caps off the cells. An electrically heated uncapper would be a great boon. A bee farmer may have 500 hives and a standard "National" hive has ten or more frames of comb in each "super" (or storey), the hives probably averaging two supers each. From each of these 10,000 or more frames, the wax caps must be removed before the honey can be extracted, and this calls for the utmost economy in time spent on each.

Another electrical need is for a warm cupboard, temperature controlled, capable of re-liquefying honey that has crystallized, but without heating it sufficiently to impair its flavour. This would enable packing to be postponed until after the summer rush. It could also contain a compartment at higher temperature for rendering down old combs and wax scrap into blocks.

Sunderland. P. RIDLER.

Union and Institution

AS a common or garden electrician I am a member of the Electrical Trades Union —subscription £3 0s. 8d. per annum; having ambition, I have attained the status of Graduate I.E.E.—subscription £2 2s. per annum. It would be rather amusing to inform the E.T.U. branch officials (V.I.P.s) that the latter subscription absolved me from the former. Upon consideration, that £3 0s. 8d. would be a better investment in the I.E.E. Benevolent Fund than in the swollen coffers of the E.T.U.

VENI, VIDI (but not) VICI.

Illuminating Engineering Society

The annual general meeting of the Illuminating Engineering Society will be held on May 13th at the Institution of Mechanical Engineers, Storey's Gate, S.W.1, and on the following day (May 14th), the annual dinner will be held at Grosvenor House, London.

Fuel Situation

Restrictions to Continue

THE Prime Minister made his expected statement on the fuel outlook in the House of Commons last week. Mr. Attlee said that the coal requirements for the six months from May to October totalled 92 million tons and in addition 10 million tons was required to build up stocks for the winter. From the total of 102 million tons could be deducted about 2 million which it was hoped to save by coal-to-oil conversion. Although measures which were being taken should result in an increased output of coal, the Government would not count on it and the deficiency might be as much as 10 million tons. It was proposed to save 250,000 tons by reducing railway passenger services and exports would be reduced but there would still be a gap which could only be filled by restrictions on domestic and non-industrial users of electricity and gas by which it was hoped to save 2½ million tons.

The Government had considered a number of alternative rationing schemes but had found them all complicated and difficult to enforce; large additional staffs would be required to work them. They had therefore decided to apply restrictions on the use of gas and electricity for heating rooms during the summer and it was also proposed to maintain, with some variation, the existing prohibition of the use of electricity during certain hours of the day and to extend this to gas. "Targets" would be set for each individual consumer to indicate the total savings expected from them. He thought that when they knew the facts all concerned would do their utmost to achieve their targets but if the savings secured proved to be insufficient the Government would have to take other measures, however drastic, to ensure that the target was achieved.

World Power Conference

Fuel Economy Papers

THE technical programme of the Fuel Economy Conference, arranged for September 2nd to 9th at the Hague by the World Power Conference, is now available. This is in three sections, viz. production, distribution and utilization. The ground covered is aptly illustrated by ten papers submitted by the British National Committee. The subjects chosen are: The British Coal Survey (Dr. A. Parker, D.S.I.R.); Coal Mining Mechanization (Prof. D. Hay, National Coal Board); Aviation Fuel (J. A. Oriel, Shell Petroleum Co., and K. Gordon, I.C.I.); Carbonization (T. U. Finlayson, Woodall-Duckham Co.); Co-ordination of Electricity Supply (Sir Johnstone Wright, Central Electricity Board); Industrial Applications of Atomic Energy (Dr. J. D. Cockcroft, Ministry of Supply Atomic Research Establishment, Harwell); Convection and Radiation in Gas Heating (Dr. A. L. Roberts, Leeds University, and L. F. Andrews, Gas Light & Coke Co.); Availability of Power Station Boilers (Dr. H. E. Crossley, Fuel Research Station; Gas-Turbine Economy (Dr. H. R. Cox, A. R. Howell and A. G. Smith, Ministry of Supply); Recovery of Industrial Low-Grade Heat (Dr. W. A. Macfarlane and J. B. M. Mason, Ministry of Fuel and Power).

Owing to the possible shortage of hotel accommodation in Holland, application forms should be completed as soon as possible. These may be obtained from the Secretary, British National Committee, World Power Conference, 201-2, Grand Buildings, Trafalgar Square, W.C.2.

Electron Microscope

Construction of New Instrument

THE design and construction of a new electron microscope are described in some detail with the aid of schematic diagrams and stabilizing circuits in a paper prepared by MR. M. E. HAINE (Metropolitan-Vickers Electrical Co., Ltd.) for the Measurements Section of the Institution of Electrical Engineers.

The instrument has been designed by the author and his collaborators. The paper includes details of the mechanical construction of the tube and its accessories as well as general notes on the vacuum system, circuits and operation of the instrument.

The best resolution so far obtained with this microscope is still two or three times greater than the theoretical limit, but efforts to improve the electron gun and objective lens are being continued. It is likely to be very much more difficult to approach nearer the theoretical limit of resolution on routine work than with a laboratory instrument receiving constant expert attention.

The paper concludes with a few results obtained with the new instrument and a bibliography of nineteen references to the subject.

Furniture for E.I.B.A. Home

THE Electrical Industries Benevolent Association is going ahead with furnishing its new home for old people at Broome Park, Betchworth, but the number of units, dockets, etc., for utility furniture and soft furnishings is limited. The Association therefore appeals to those who have spare furniture for which they have had difficulty in "finding a home" because it had too many sentimental associations to be sold, could very well settle their problem by giving it for the home. Furniture of the kind which is often too big for a modern house, will be welcome, as will soft furnishings, curtains and floor coverings.

Offers in the first instance should be communicated to the Secretary, 32, Old Burlington Street, W.1, so that arrangements can be made for transport.

PERSONAL and SOCIAL

News of Men and Women of the Industry

IN our issue of January 3rd last we announced the appointment of **Mr. A. N. Bott** as city electrical engineer at Winchester. Mr. Bott, who has been with the Kirkcudbright county undertaking since 1935, latterly as county electrical engineer, now informs us that he is taking up his new duties at Winchester on April 14th.

Mr. A. N. Bott

After more than twenty-two years with the East Anglian Electric Supply Co. **Mr. S. H. Money** left on April 1st to take up the position of county electrical engineer in Kirkcudbrightshire. Starting as an apprentice in the Felixstowe undertaking he graduated through various positions to the post of engineer in charge of the company's Norfolk area. Mr. Money received his technical training at the Ipswich and Chelmsford Schools of Art and Technology.

Sir **Frank Smith** has retired from the chairmanship of the Minister of Supply's Advisory Council on Scientific Research and Technical Development. He is succeeded by **Professor Sir John Lennard-Jones.**

Mr. S. B. Richards, A.M.I.E.E., has been appointed assistant mains engineer with First Garden City Ltd., Letchworth, Herts. Mr. Richards was educated at University College, Nottingham, and from 1929 to 1943 he was employed by the Derby & Notts. Electric Power Co., with whom he became assistant maintenance and testing engineer. From 1943 to January, 1947, he was an electrical officer in the R.A.F. He commenced his new duties on March 17th

Alderman C. W. Dixon, Mayor of East Ham, accompanied by Mrs. Dixon, was the guest of honour at a luncheon given recently by Standard Telephones & Cables, Ltd., by whom he is employed. Sir Thomas Spencer, managing director, who presided, complimented Mr. Dixon on his successful public career. Alderman Dixon is a member of the Council of the I.M.E.A. and has been chairman of the East Ham Electricity Committee for the past fourteen years.

Mr. W. Taylor, A.M.I.E.E., has been appointed technical assistant in the Cheltenham Electricity Department. After a period with the Stalybridge, etc., Board, Mr. Taylor served with the R.E. and R.E.M.E. during the war, reaching the rank of major. **Mr. E. Mills,** A.M.I.E.E., has been appointed deputy mains engineer in the Department. Mr. Mills was in business on his own account before going to Callender's Contract Department and, later, to Ealing Corporation, where he was senior distribution assistant.

Mr. N. V. Baldwin, A.M.I.E.E., who has been manager of the Bristol office of Igranic Electric Co., Ltd., for twenty years, has been appointed manager of the London office. Mr. Baldwin joined the company twenty-five years ago, and was formerly at the Bedford, London and Glasgow offices. **Mr. W. G. E. Jacob,** who has been at the Birmingham office of Igranic Electric Co. for some time, and was recently released from the Forces, has taken over the Bristol office from April 1st.

Mr. C. Beck, shift charge engineer with Scarborough Electricity Department, has been appointed district engineer at Filey.

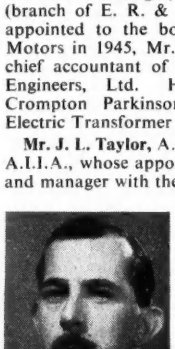
In connection with the exchange of shares between Johnson & Phillips, Ltd., and the Telegraph Construction & Maintenance Co., Ltd., a dinner of directors and executives of both companies was held at Manetta's Restaurant on March 19th during which the formal exchange of share certificates took place. In the accompanying picture **Sir Geoffrey Clarke,** chairman

Sir Geoffrey Clarke and Mr. G. L. Wates formally exchanging share certificates in connection with the arrangement between Johnson & Phillips, Ltd., and the Telegraph Construction & Maintenance Co., Ltd.

of the Telegraph Construction & Maintenance Co., and **Mr. C. L. Wates,** chairman of Johnson & Phillips, are seen making the formal exchange.

Mr. J. E. Wright, secretary of Bull Motors (branch of E. R. & F. Turner, Ltd.) has been appointed to the board. Before joining Bull Motors in 1945, Mr. Wright was secretary and chief accountant of K. & L. Steelfounders & Engineers, Ltd. He was previously with Crompton Parkinson, Ltd., and the British Electric Transformer Co.

Mr. J. L. Taylor, A.M.I.E.E., M. Amer. I.E.E., A.I.I.A., whose appointment as deputy engineer and manager with the City of Oxford Electricity Department we briefly announced last week, attended Walsall Technical College and served an articled apprenticeship with the G.E.C. at Witton, Birmingham. In 1934 he joined the Electric Construction Co., Ltd., Wolverhampton, and in 1941 he became associated with the Mid-Lincolnshire Electric Co., Ltd., as technical assistant to the engineer and manager, being promoted to his present position of technical superintendent in 1944. Mr. Taylor was a member of the I.E.E. Students' Section Committee at Birmingham from 1938-41 and in 1939 received the I.E.E. Students' Premium for a paper entitled "Automatic Voltage Regulators for Generators." He takes up his appointment at Oxford in May.



Mr. J. L. Taylor

Mr. L. G. Howarth, for over twenty years sales manager to Harcourts, Ltd., retired on March 31st because of ill-health.

Mr. W. M. Betts has been appointed manager of Harcourts' Electric Fittings Department and will control the company's sales policy and fittings development and design.

Mr. F. W. Halliwell has been elected president of the Gauge and Tool Makers' Association for 1947-48 and **Mr. H. S. Holden** is chairman.

Mr. E. C. Baillie has resigned from the boards of the Radio and Television Trust and its subsidiary companies but is remaining available in an advisory capacity.

Mr. L. K. Travis has been promoted to first assistant mains engineer in the Brighton undertaking at a salary of £616 per annum.

Mr. D. Nuttall, chief meter tester with the Heston & Isleworth Corporation, has been appointed assistant meter superintendent at Hammersmith at a commencing salary of £565. **Mr. C. T. Barker,** who was already with the undertaking, has been appointed to the position of testing assistant.

Mr. P. Jackson, A.C.G.I., has been appointed electrical engineer to the A.C.-Sphinx Sparking Plugs Co., Ltd. For the past twenty-seven years he has been designer and chief of test with George Kent, Ltd., and he was originally with the British Thomson-Houston Co., Ltd.

At the annual general meeting of the Birmingham Electric Club on March 17th, **Mr. A. H. Goude,** manager of the Lamp and Lighting Department of the Birmingham Office of the British Thomson-Houston Co., Ltd., was elected social secretary.

The "Old Centralians" (old students' association of the City and Guilds Engineering College) held the first annual dinner of the newly formed Midland branch on March 15th in Birmingham, which was attended by over thirty members. The branch chairman is **Mr. J. P. Clifton,** A.M.I.E.E., deputy contracts manager of the General Electric Co., Ltd., Witton. "Old Centralians" in the Midland area who are not already aware of the formation of the branch are asked to get into touch with Mr. A. A. Blanco hon. branch secretary, at "The Beeches," 2, Woodlands Park Road, Kings Norton, Birmingham.

Mr. B. Calvert, B.Sc., of Sheffield Electricity Department, has been appointed mains superintendent in the Scarborough Electricity Department. He is an associate member of the Institutions of Civil and Electrical Engineers.

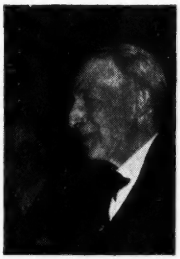
Obituary

Mr. F. W. Crawter.—We regret to learn of the death at Warlingham, Surrey, on March 24th, of Mr. Frank Whinfield Crawter, M.I.E.E., who was associated with many of the early applications of storage batteries, including tramcars at Barking in 1892, and held the position of London manager of the Chloride Electrical Storage Co. from 1896 until his retirement in 1933. Mr. Crawter was born at Cheshunt in February, 1868, and was educated at private schools and Malvern College, also attending the Regent Street Polytechnic and Finsbury Technical College. He served his apprenticeship with Gwynne & Co., Victoria Embankment, and after periods with the Immisch Co. and in charge of the electrical department of S. Cutler & Sons, Millwall, he joined the Chloride Co. He served several times on the Council of the Institution of Electrical Engineers and was hon. treasurer from 1934 to 1937. He presented to the Institution some photographs of the earliest electric vehicles made in England.

Mr. A. M. Pooley.—The death occurred at his home, Riverdale, Tixall, Stafford, on March 22nd, at the age of sixty-eight, of Mr. Arthur Milnes Pooley, former general and works manager of the fuse-gear section of the English Electric Co., Ltd., Stafford. Mr. Pooley, who retired in 1944, was a native of Lytham, and was educated at Bedford School and London University. In the first world war he worked with Sir Albert Stern on tank production in London, being awarded the M.B.E. He joined

the English Electric Co. in 1919, as manager of the small tools and fusegear department at Coventry and went to Stafford in 1932 when the department was transferred.

Mr. J. W. Beauchamp.—Many people in the electrical industry will learn with great regret of the death on March 28th of Mr. Joseph William Beauchamp, the first director of the British Electrical Development Association which he was instrumental in forming. Mr. Beauchamp, who was seventy-four, had held a number of positions in the electricity supply industry before he became identified with E.D.A. He was deputy engineer at Sheffield for a time and was then chief engineer at Tunbridge Wells and West Ham respectively.



The late Mr. J. W. Beauchamp
(Photograph taken at the 1945 E.D.A. annual luncheon)

He had been at West Ham for about seven years when, in 1919, E.D.A. was inaugurated. Funds were slow in coming in but Mr. Beauchamp's enthusiasm for the cause of electrical development, involving him in a tremendous amount of hard work, shared by the present general manager, Mr. V. W. Dale, soon began to take effect and within a very few years E.D.A. became established as an essential part of the electrical industry.

In 1927 Mr. Beauchamp gave up the directorship to become general manager of the South Wales Power Co. and about three years later joined the Central Electricity Board as district manager for South-West England and South Wales. He was appointed commercial manager to the Board in 1935 and retired from that position in 1937 since when, although out of harness, he had continued to take a lively interest in electrical affairs.

He had served as a member of the I.E.E. Council and read a paper on "The Supply and Use of Electricity in the Home" at the World Power Congress in Vienna in 1938.

It is perhaps not too much to say that Mr. Beauchamp, by his E.D.A. work, was responsible more than any other one man in the industry for the electrical progress which has been made in the last two or three decades.

Mr. Henry M. Pease, first vice-chairman and a director of the International Standard Electric Corporation, the manufacturing associate of the International Telephone and Telegraph Corporation, of which he was also a vice-president and director, died on March 7th at the New York Hospital at the age of seventy-one, after a short illness. Mr. Pease was an outstanding figure in the telephone manufacturing field and a leading figure in telephone development in Europe and many other parts of the world. He began his business career with the Western Electric Co., in Chicago, and in December, 1902, he was transferred to the London branch of the Western Electric Co., to supervise the installation of central battery telephone exchanges for the British Post Office and the National Telephone Co.

He became managing director of the Western Electric Co., Ltd., in England in 1919. In 1922 he took an active part in the formation of the British Broadcasting Company, becoming one of its original directors. In 1925, when the International Western Electric Co. changed its name to International Standard Electric Corporation, Mr. Pease became managing director of Standard Telephones and Cables, Ltd., the new company formed as successor to Western Electric Co., Ltd. In 1927 he was made general manager of all the Corporation's properties in Europe, Africa, Australasia and India. He returned to New York in 1933 as vice-president and director of the International Standard Electric Corporation, and in 1937 he was made a vice-president and a director of I.T. & T. Early in 1941 he became president of I.S.E., and last year assumed the post of first vice-chairman of the board.

Mr. A. E. Tanner.—We regret to learn that Mr. A. E. Tanner died in Manchester on March 26th. Mr. Tanner joined W. T. Glover & Co., Ltd., as contracts manager in 1897 and was appointed to the board in 1907. At the time of his retirement in 1945 he was assistant managing director of the company. He was also a director of other companies. Mr. Tanner was very active in the Cable Makers' Association and served as chairman in 1918, 1932 and 1938.

Mr. Charles Wood, who died suddenly on March 10th at the age of seventy-four, was chairman and joint managing director of Scupham & Wood, Ltd., timber merchants and manufacturers of electric wood blocks and accessories. He had almost completed sixty years with his company.

Mr. D. C. McLennan, former manager of the Birmingham branch of Johnson & Phillips, Ltd., died on February 28th. Mr. McLennan was appointed manager of the Birmingham branch in 1932. In July, 1945, he resigned his position on account of ill-health.

Mr. F. J. Thompson.—The death is reported, on March 27th at the age of seventy-one, of Mr. Frederick John Thompson, A.M.I.E.E., of Twickenham.

Sir Harry Greer, former chairman of Baird Television, Ltd., died recently at the age of seventy-two.

Wills.—Mr. A. O. T. Webb, manager in Northern Ireland for Crompton Parkinson, Ltd., left £2,225 (net personalty £2,036).

Mr. L. P. Christy, managing director of Christy Bros. & Co., Ltd., left £49,284 (net personalty £46,496).

Electricity Bill

Holding Companies and Composite Undertakings

CONCESSIONS of a somewhat minor character were made when the Electricity Bill was further considered by Standing Committee E of the House of Commons last week. On Clause 13 (Vesting of assets of electricity undertakings) Mr. Shinwell (Minister of Fuel and Power) said that the Ministry had reached the conclusion that the definition of "authorized undertakers" was perhaps too wide. There were various types of authorized undertakings. Some were quite simple: that was to say, they dealt primarily with electricity supplies. There were others, however, of a composite character, dealing with transport, gas, water and so on. In order to avoid any ambiguity, it appeared to be necessary to provide a more accurate definition. What he proposed was that at a later stage they should find a more suitable form of words.

"Authorized Undertakings" to be Defined

It was possible that they might have to proceed by the method of individual notices to authorized undertakings, or, alternatively, by providing a schedule in the Bill. He was not quite certain whether the latter alternative would be better. It was open to objection, but it was a matter that would require to be considered. It was the intention of the Government to provide a form of words which was as accurate as possible.

Mr. Gaitskell, Parliamentary Secretary to the Ministry, then indicated the general attitude of the Government to the problem of holding companies. He said that these were not purely financial organizations, concerned merely to hold shares in other companies; they managed in a greater or lesser degree the subsidiaries which they controlled. Therefore, when the Government considered what was to be done about them they felt bound to have regard to that managerial function and to make provision for taking some of them over. They had no desire to take over companies which were really financial in character and, after seeking the advice of the Electricity Commissioners, they drafted the Bill in its present form providing that any company in which 75 per cent of its assets were in the form of shares in authorized undertakings was, for this purpose, to be taken over.

Holding Companies Without Control

On the second reading Sir Arnold Gridley had asked if there were companies which would fall to be taken over under the present Bill, and yet which controlled no authorized undertaking at all, and whether the Government still wished to take them over. He (Mr. Gaitskell) told Sir Arnold that they did not wish to take over a company which had no controlling interest in any electricity undertaking. He also added that the Government was not aware of any company in that position.

He must now tell the Committee that it had been found that there was one company of this kind, and the Government intended to introduce, on the report stage, an amendment which would make it plain that the Government would not take over any company which had no control of an electrical undertaking; in other words, where its holdings in electricity undertakings might be 75 per cent of its total assets but where, nevertheless, it exercised no control whatever.

A long discussion followed and several amendments were moved and negatived. On an amendment moved by Mr. Foster to deal with those undertakings which would come within the definition of an "authorized undertaker" in the Bill where they carried on gas, water or road transport undertakings, Mr. Gaitskell explained that there were, according to his information, fourteen such concerns out of some 600 undertakings. Ten of them dealt with gas and electricity only: two had transport undertakings; one dealt with gas and water; and one with property, gas and water. Because gas was going to be nationalized, it seemed unnecessary to make a double change in such cases.

Temporary Arrangements

He agreed that it would be necessary for the gas undertakings to be run in the interim period, but he thought that there would be no difficulty in arranging to run the undertakings, under the supervision for the time being of the Area Board, or of some other, temporary, organization. As regarded the other undertakings, he felt that the Government would probably have to make some arrangements in advance of the vesting date. As the Bill was drafted at the moment there was nothing to prevent those undertakings from splitting themselves, and they might set up either a new company to manage the electricity side or one to manage the other side.

They were negotiating in at least one case and no doubt would be negotiating in other cases where they thought it necessary that separation should take place before the vesting date. So far as he was aware, the discussions had been amicable and were likely to reach a satisfactory conclusion.

The amendment was negatived.

Mr. Raikes moved a further amendment to provide that if the undertaker so requested, the Minister should decide a month before the vesting date whether certain undertakings were to be taken over or dissolved.

The Lord Advocate said he could not accept

this as it would tie the hands of the Minister and the amendment was negatived.

Directors as Employees

Sir Frank Soskice, Solicitor General, explained the position of present employees under the Bill, and said that all contracts of employment would be automatically transferred from the old undertakings. If an employee felt aggrieved and did not consider he had been given reasonably comparable employment he could appeal to the courts.

Mr. Raikes moved the deletion of the proviso that directors, other than a managing director, should not be transferred. He said that as the Bill stood directors with long-term contracts of service could be summarily dismissed without any compensation.

Mr. Gaitskell replied that there would be no reasonable comparable services for part-time directors to perform in the new situation. He was willing, however, to accept an amendment that directors whose functions were substantially those of an employee should be transferred. Certain directors would find seats on the boards to be set up under the new regime. Where a director was substantially an employee of an undertaking or held a responsible position, the Government would be ready to compensate him.

Water Power in Canada

Potential Surplus Largely Absorbed

THE high level of industrial activity and growing domestic loads in Canada have largely absorbed the surplus power which it was thought would result from the cessation of war demands. This is recorded in the 1946 review of the Dominion Water and Power Bureau, which adds that in some districts the primary demand threatens to exceed the supply. New installations brought into operation aggregated only 27,760 H.P., but at the end of the year schemes with total capacity of over 400,000 H.P. were under active construction and preliminary work was under way on projects involving an additional 600,000 H.P. A good start was made on an extensive post-war programme of extending services to farms and small rural communities, particularly in Manitoba and Ontario, although plans had to be somewhat curtailed through shortages of material and labour. The following is a summary of the salient activities in the various provinces:—

Ontario.—A second 70,000-H.P. unit at DeCew Falls is expected to be in service by October next. Work proceeded actively on the 81,000-H.P. development at Stewartville on the Madawaska River. The tunnel through which the river will be diverted during the construction period was completed in October and the first unit of the plant is expected to be in operation by February 1st, 1948. Preliminary work has also commenced on the Des Joachims development on the Ottawa River, about 38 miles upstream from Pembroke, which will have a capacity of 360,000 H.P. in six units, with provision for two additional units. The plant will have an operating head of 135 ft. Work is proceeding on the re-routing of the Canadian Pacific Railway and of Highway No. 17 and on the construction of access roads and camps. The first three units are expected to be in service in 1951 and the remainder a year later. A new development was commenced on the Aguasabon River, with power house located at Terrace Bay on Lake Superior. The plant will operate under a head of 297 ft and will contain two units, the turbines being rated at 27,500 H.P. each. Water will be conveyed from headworks to turbines through a concrete lined tunnel, 15 ft diameter, and about 3,800 ft long. During the year 1,150 miles of rural distribution lines and 377 miles of transmission lines were built.

Quebec.—Application has been made to the authorities for permission to install a fourteenth unit of 50,000 H.P. in the Beauharnois plant. The Shawinigan Water & Power Co. carried out extensions to its distribution system, including rural electrification, involving an expenditure of about $2,500,000, and an important addition to the generating capacity of the company's development at Shawinigan Falls has been undertaken, comprising three additional 65,000-H.P. units to be installed in a new power house. The Gatineau Power Co. expects to complete the installation of the fifth and final 24,000-H.P. hydro-electric generating unit in the Farmers Rapids plant on the Gatineau River early this year.

British Columbia.—The British Columbia Power Commission made good progress on the first phase of its development on the Campbell River, Vancouver Island, consisting of two 25,000-H.P. units, the first of which is expected to be brought into operation this year. Construction of the British Columbia Electric Railway Co.'s Bridge River project, designed initially for a single 62,000-H.P. unit, has been proceeding according to schedule, and a beginning has been made on a 130-mile transmission line from Seton Lake to Vancouver. The planned interconnection with the Bonneville Power Administration has been delayed by material shortage.

Manitoba.—About 286 miles of transmission lines were built to serve towns and small communities, and extension of the "Farm Electrification Program" involved construction of 939 miles of transmission lines of all types.

Fuse-Switches

Selection of Most Suitable Types

By J. Shepherd and P. J. Shipton, A.M.I.E.E.

EQUIPMENT controlled by a distribution board usually includes a number of items differing in their ability to withstand surge currents and volts, but, despite the importance of providing economical protection, selection of the most suitable switch and fuse ratings is too often of a haphazard character.

Thus, it is not uncommon for industrial users to purchase fuse-switches of the next higher rating than that required for the application in view on the ground that the unit, although primarily designed for domestic use, is liberally rated and in consequence is suitable for a more exacting duty. Nevertheless switch-fuses that are specifically designed for industrial application are capable not only of dealing with loads up to their rated capacities, but also of carrying substantial overloads for definite periods without overheating.

Data are available that enable a selection to be made for all types of loading and circuit conditions and particular problems should be referred to the designer. A fuse can now be designed to meet any conditions, but except in very special cases the most economical course is to make one's choice from a standard range of existing fuse characteristics.

Trouble caused by single-phasing due to a fuse blowing in one phase, can be overcome by the use of a fuse fitted with a striker pin (Fig. 1). This, in addition to meeting all the normal requirements of a fuse-switch, embodies an auxiliary trip switch, which is opened by the striker pin automatically, immediately after the fuse blows. The auxiliary switch can open the coil circuit of a main circuit-breaker and/or close an alarm circuit.

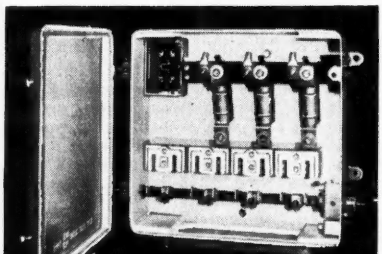


Fig. 1.—Fuses fitted with striker pin to afford open-phase protection

Where separate lighting, heating and power

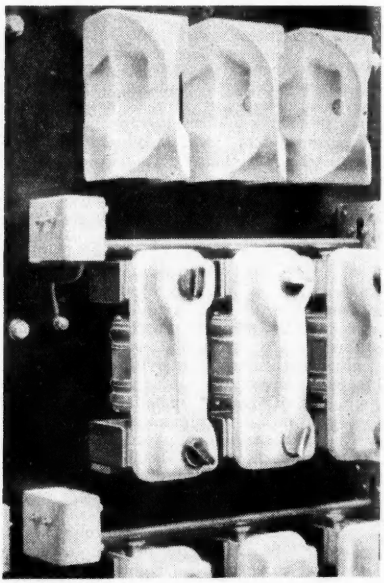


Fig. 2.—Fuse board with tripping device

circuits are in use with a unit of this kind, emergency conditions can at once be indicated to the maintenance staff and, if the unit is used in conjunction with an electrically operated circuit breaker, the latter can be opened and the supply cut off from the affected section.

Alternatively the condition of the circuit can be indicated at a central control point where steps can be taken to deal with the situation. The same method can be applied to a fuseboard, and power-station fuse

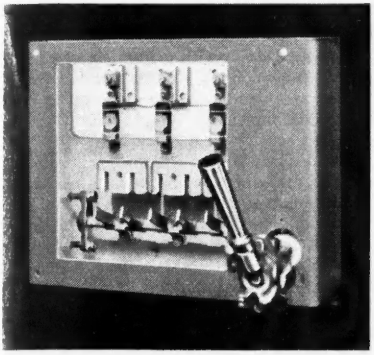


Fig. 3.—Switch-fuse unit for building into main switchboard

distribution boards have been built incorporating the striker-pin and trip arrangement (Fig. 2). While this method protects motors against single-phase running due to a fuse operating, it does not provide complete single-phase protection. A fault in a motor winding or to earth or a lost phase for any other reason than a blown fuse can still occur. In a delta-wound machine, for example, a break in one phase-winding can cause an increase in current in the other windings of 73 per cent without increase of line current.

Designs of fuse-switch for use on cubicle switchboards have been in demand during the last few years, particularly where the gear operates in conjunction with motor-starting equipment and is backed by main incoming circuit-breakers and protective apparatus.

Fuse-switch and distribution equipment when built into a switchboard has a very neat appearance and is often to be preferred to the alternative of being mounted as an appendage to a switchboard. A built-in equipment for front operation can retain all the essential features of fuse-switch gear and, at the same time, provide a complete standard unit suitable for building into practically any type of main switchboard. Such a unit, complete in its own sheet-steel supporting wrapping, can be bolted direct inside the main switchboard casing (Fig. 3). The interlocking of the door covering the unit is fairly easy to arrange, together with any electrical interlocks which may be required. Similar built-in designs can be made for single-way switches only or for changeover and reversing switches.

The unit design is well-established for fuse-switch switchboard construction and the usual arrangement is to have standard units mounted above and below a section of busbar chamber. The units can be complete switchfuses or built-up in brick formation—one case having the switch, another the fuse and a third the length of busbar chamber. This design provides a ready-made set of units, which can be assembled to meet varying requirements.

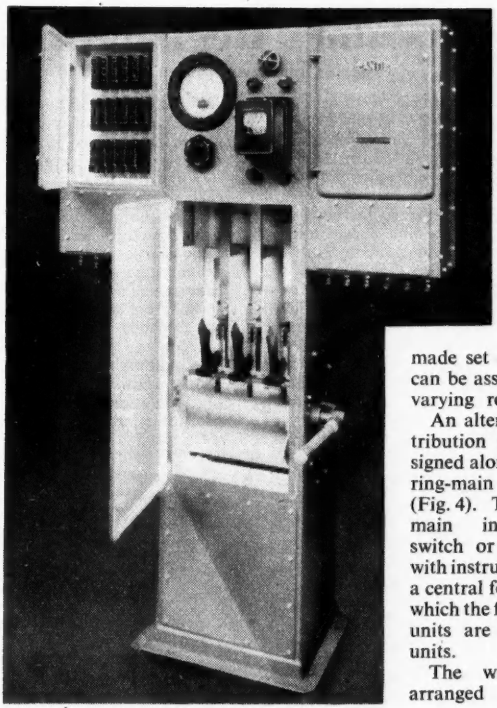


Fig. 4.—Wing-type distribution feed pillar

An alternative is a distribution pillar unit, designed along the lines of a ring-main isolating unit (Fig. 4). This comprises a main incoming fuse-switch or circuit-breaker with instruments built into a central feed pillar, on to which the fuse distribution units are built as wing units.

The wing units are arranged for varying

numbers of outgoing ways and fed from a main set of busbars coming from the feeding pillar. They are complete in themselves and are interchangeable and can be used as separate fuse distribution boards. Such an arrangement finds favour where the ultimate number of outgoing ways and their capacities are expected to vary owing to extensions of plant and power supplies.

Special designs must retain the normal interlocks and usual requirements of the relevant B.S. Specifications. A recent I.E.E. paper by W. Fordham Cooper, which dealt with electrical control of dangerous machinery, contained the commendable suggestion that in the initial tests on a piece of protective gear one should first try to operate it incorrectly and if there were any interlocks try to beat them.

Mr. Cooper mentioned an accident in which a machine started and killed a man, as a result of uncertainty as to whether the isolating switch had been properly opened, since the handle of the switch could be brought very near to the "off" position although the contacts could remain closed. This can be done with a number of existing designs in which the switch-handle position is used as an indicator because, in an over-centre mechanism, a false position can be indicated as a result of back-lash.

One design which overcomes this difficulty has free movement in the handle mechanism which is used to wind up a spring. Until this is wound to the full there can be no movement of the switch blades, because they are locked in position by a bolt mechanism. The bolt is withdrawn only when the spring is fully wound and in this way positive action is assured and the contacts cannot move either on or off due to vibration or incorrect operation of the switch. Coupled with this an "on-off" indicator can be fitted directly to the shaft operating the switch blades, thus showing the actual switch-blade position, irrespective of any other feature of the gear. Switches of this design are in use by at least one of the leading railway companies.

Queensland's Regional Boards

Progress of Development Scheme

BY the Regional Electric Authorities Act, 1945 (see *Electrical Review*, July 13th, 1945) a new system of electricity supply organization and control was initiated in Queensland. The Act provides for representatives of central and local authorities to be combined in Regional Boards, four of which have so far been established, embracing thirty-nine local authority areas and involving the amalgamation of fifteen separate supply authorities. The State Electricity Commission, in its latest annual report—the ninth since its formation—expresses the opinion that the results justify an optimistic view of the future of the regional system.

To implement an extensive development campaign planned to be carried out by the new authorities it became necessary to establish three new regional generating stations in a short time at Howard, Rockhampton and Townsville. By arrangement with the Regional Boards the Electricity Commission undertook the work of designing the stations and ordering the plant, and the chairman, Mr. S. F. Cochran, on a visit to Britain, was able to secure the placing of urgently required equipment at a high level in the manufacturing programme. Altogether, loan expenditure by the four Regional Boards in 1946–47 is expected to total £1,941,966, with considerable further expenditure in subsequent years until the capital programme is completed. As in this country, there are serious difficulties due to shortage of man-power and materials. Coal reserves are extremely low and the quality of supplies poor (the ash content of coal received at the Brisbane power houses has increased from 11 per cent in 1936 to 22 per cent in 1946).

When the Regional Boards assumed control each of the separate undertakings had its own scale of charges which varied greatly. Standard tariff structures were therefore introduced, with basic charges in the load centres and surcharges of varying percentages in other areas; these charges will be reviewed when the new generating stations are in operation and transmission lines are extended to areas now supplied from local sources. It is considered financially impracticable to apply uniform tariffs in a state with such widely scattered communities and low density of population. Justifying the requirement of guarantees, the report points out that without them losses would be borne by other consumers, causing tariffs to be raised and ultimately this would stop development altogether.

Statistical information shows that in the year ended June 30th, 1945, electricity authorities sold 381·5 million kWh, compared with 350·2 million in the previous year; the number of consumers rose from 184,381 to 187,264, and the average annual consumption from 1,899 to 2,037 kWh (or from 1,650 to 1,765 kWh when street lighting, water supply pumping and bulk supply at special rates are excluded). The average annual cost per kWh sold was 1·34d. (against 1·365d.) and the average revenue 1·656d. (1·677d.).

COMMERCE and INDUSTRY

Industrial Generating Plant.

LAST week it was reported that the Ministry of Supply had placed an order, valued at £1,000,000, with J. & H. Maclaren, Ltd., for Diesel-driven generating sets. The facts are that the Ministry has allocated the necessary material for the work and has asked to be given a say in the distribution of the sets to ensure that they go to the most "vital" establishments.

The work is being undertaken by Associated British Oil Engines, Ltd., and the sets, numbering 1,500, will comprise Maclaren " M.R. 4 " four-cylinder, four-stroke, 88-H.P. engines direct coupled to 55-kW Brush generators, together with the necessary switchgear. It is hoped to complete the work by the end of this year.

British Railway Mission in Portugal

A British railway mission representing the Metropolitan-Vickers Electrical Co., Ltd., and the English Electric Co., Ltd., is now in Portugal examining the possibilities of electrifying Portuguese railways. According to *Reuter's Trade Service* (Lisbon) the mission's visit is the result of hydro-electric development in Portugal in connection with which important contracts have already been placed with these companies.

New E.I.B.A. Branch

Representatives of all branches of the electrical industry have formed a branch of the Electrical Industries' Benevolent Association in Kent, with the following officers:—Chairman, Mr. E. E. Hoadley; vice-chairman, Mr. T. W. Dann; secretary, Mr. S. S. Wernham; treasurer, Mr. E. E. Pope.

Lebanese Duties Reduced

The Lebanese-Syrian Supreme Council of Common Interests has made a number of modifications in the joint " normal " Customs tariff. Among the articles affected are refrigerators for industrial use (duty reduced from 25 per cent to 1 per cent *ad valorem*); electric exciters and their rheostats, generating machines, alternators, motors, convertors, transformers, etc. (from 7·5 to 1 per cent); industrial electric ovens (from 7·5 to 1 per cent); and electro-medical and radiological apparatus (from 25 to 11 per cent).

Deferment of Apprentices.

Kenya Customs Duties

Among the alterations effected by the Kenya Customs Tariff Ordinance, 1946, is the admission free of duty of "machinery, apparatus, appliances and instruments . . . and electrical material used in connection therewith for the generation, storage, transmission, distribution of or lighting by gas or electric power, but not including electroliers, gasoliers, lamps, lampshades or reflectors, portable batteries or electrical appliances for use in connection with vehicles "; and telegraph and telephone materials, equipment, etc., imported for use by a public utility company for telegraphy, telephony or radio-communication.

L.E.P.'s 100,000th Meter

On March 19th the Lancashire Electric Power Co. celebrated the testing and issue of its 100,000th meter, and at a dinner, followed by a concert, held to mark the event, Mr. W. D. Sutcliffe (superintendent, Meter Department) mentioned that although the 100,000th meter was an important stage in the development of the company it did not give any true indication either of the scale of the work of the Testing Department or of the size of the company, in view of the fact that a big portion of the company's business was power for industry and bulk supplies. Mr. M. H. Adams, chief engineer and manager, said that the Testing Department had a fine war record. No less than 40 per cent of the staff were in the forces or transferred to other essential work, yet the depleted staff were able to carry out an important contract for the Admiralty. Mr. E. Roscoe,

Meter Testing Department of the Lancashire Electric Power Co.

assistant superintendent of the Testing Department, welcomed the guests, making special reference to Mr. Hamer, area meter examiner for the Electricity Commission. Mr. J. W. Jones, Chorley district manager, responded.

Mr. S. M. Rix, secretary and assistant manager, then made a presentation of a wristlet watch to Mr. O. Howarth, chief technical officer and sales manager, as an expression of appreciation of his work for the Testing Department which was largely designed by him, Mr. R. C. Leslie being largely responsible for the building work.

Lighting Service Courses

Several short courses on electric lighting for the Army have been held from time to time at the Lighting Service Bureau. The most recent was held on March 21st and in addition to the men Col. F. P. Roe, Command Education Officer for the London District, and other officers attended. In the accompanying picture Mr. E. B. Sawyer, manager of the Lighting Service Bureau, is seen explaining one of the features in the architectural lighting studio.

Army personnel at a Lighting Service Bureau course

The forty-eighth Illumination Design Course will be held at the Lighting Service Bureau from May 6th to 9th.

Interrupted Apprenticeships

In view of the fact that as from January 1st, 1947, youths who are serving genuine and satisfactory apprenticeships, may secure deferment for the period necessary to complete their training, the Minister of Labour has decided that the provisions of the Interrupted Apprenticeship Scheme shall not apply to apprentices called up during 1947 and 1948.

Mr. L. C. Penwill, Director of the Electrical Contractors' Association, says that this decision is of considerable importance to apprentices in that should they decide to break their apprenticeships by serving in H.M. Forces rather than secure a deferment until their apprenticeships expire, they will no longer be entitled to the benefits of the Interrupted Apprenticeship Scheme upon their return to civilian life.

Modern Homes Exhibition

The principal electrical feature of the Modern Homes Exhibition (organized by the *Daily Herald*), now being held at Dorland Hall, Regent Street, London, is the "universal plan" electric kitchen sponsored by E.D.A. In this kitchen full advantage is taken of the ease with which electricity can be conveyed to where it is wanted to arrange the cooker, refrigerator, water-heater, and washing machine in the most convenient manner. Special features are fluorescent lighting, a built-in extractor fan, and a compact cooker with drop-down oven door. This has tubular sheathed-wire elements and is thermostatically controlled. The kitchen, which has been designed by Mr. A. L. Osborne, can be adapted to fit a variety of rooms.

Among the labour-saving devices no show are electric irons, electrically-heated clothes horses and washing machines. Furnished rooms provide an opportunity to demonstrate various other up-to-date electrical appliances.

Tungsten Ore Prices

As from March 28th the price of tungsten ore of standard grade from Government stocks is 100s. per unit of WO_3 delivered consumers' works. For special high grade scheelite to the following specification—WO_3 minimum 68 per cent, tin maximum 0·60 per cent, arsenic maximum 0·10 per cent, molybdenum maximum 0·10 per cent, the price will be 105s. per unit WO_3 delivered consumers' works.

German Generators for Britain

Representatives of the Central Electricity Board and the Board of Trade have been visiting Germany to investigate the possibility of purchasing generating plant there. A *Reuter* message says that six generators costing £50,000 will be bought from the Siemens power factories in Mülheim.

Birmingham Economic Debate

Speaking at a meeting of the Birmingham Chamber of Commerce held last week to consider a report on the Government's economic survey, Mr. W. F. Higgs moved the reference back of the report which, he said, was "disappointing and unworthy." After a reference to the coal position, Mr. Higgs said that although labour was badly needed, about 1,500,000 men remained in the armed forces. The country's

overseas commitments were too heavy and unless something was done we would fall economically—not militarily.

In the course of further debate Dr. C. C. Garrard emphasized that the power problem arose not from a shortage of coal but from a lack of electrical equipment which dated from seven years ago. The Government should say clearly what was wanted and give manufacturers the necessary facilities to get on with the job. He doubted whether the position would be righted by 1950-51. It would be necessary both to extend manufacturing facilities and to stop the export of electrical equipment until the problem was solved.

All-Electric House Costs

Speaking on "Electrical Installations and Appliances" at the Scottish Fuel Efficiency Conference at Glasgow last week Mr. C. H. A. Collyns, general manager of the Lothians Electric Power Co., said that the total fuel cost for an all-electric house in Scotland was in general less than the combined costs of a mixture of methods for lighting, heating, and cooking. With the average domestic all-in tariff prevailing in Scotland, he said, the annual consumption was well within the pocket of the domestic consumer, and the load imposed on distribution networks and generating plant was astonishingly small.

Cable Makers' Agreements

Agreements relating to the reduction of the normal working week from 47 to 44 hours and providing for the recognition of shop stewards are now available in printed form from the Joint Industrial Council for the Electrical Cable Making Industry, High Holborn House, 52-54, High Holborn, London, W.C.1.

Reports on German Industry

Among the latest reports on German industry to be published are the following:—B.I.O.S. 530 "Photosurfaces. A Report on German Developments of Photocells, Electron Multipliers, Television Pick-up Tubes" (6s.); B.I.O.S. 999 "Manufacture and Fabrication of Polyvinyl Chloride. Bitterfeld Area" (9s.); and B.I.O.S. 1136 "Technical Survey of Electric Cable Industry in Germany" (5s. 6d.). Evaluation reports include B.I.O.S. E/R 178, Telefonbau und Normalzeit, "Electric Tachometer" (2d.). A few copies are available at H.M. Stationery Office and the reports may be seen at a number of the leading libraries.

History of Higgs Motors

In 1912, Higgs Motors, Ltd., commenced the manufacture of electric motors for industrial purposes. The whole factory at that time was driven by a 3-H.P. motor and the total wages were about £6 per week. The story of the company's growth from those early days to its present important position in the field of electric motor manufacture is told in a well-illustrated booklet entitled "Starting from Scratch," which the company has just issued.

Gas-Electric Comparisons

In the House of Commons last week Sir Stanley Reed asked the Minister of Fuel and Power what scientific estimate had been made of the respective merits of gas and electricity in the provision of heat for cooking.

Mr. Shinwell said that so far as he was aware, no precise scientific estimate had been made on this question, which in practice was complicated both by the wide variations in methods of using cooking appliances and by the different efficiencies with which gas and electricity were obtained from coal.

Service Generators for Industry

On March 26th Sir Jocelyn Lucas asked the President of the Board of Trade how many of the Diesel generators offered by the three services for loan or hire to industry during the present crisis had actually been allocated to individual firms; and how many were still available.

Mr. Belcher said that the number allocated between February 17th and March 20th was 513, of which 278 were Diesels. The number of such sets available for loan in approved cases as at March 20th was 641, of which 540 were Diesels.

Fleetwood "Chief's" Position

Fleetwood Town Council on March 27th referred back an Electricity Committee resolution for advertising the position of chief electrical engineer and manager at a salary of £846 rising to £1,095; Mr. W. P. Lilwall, the present engineer, retires at the end of May. Alderman C. Saer, electricity chairman opposing, said the resolution stated plainly the decision to advertise for a qualified electrical engineer to take Mr. Lilwall's place. The scale was adopted very widely and began at a considerably lower figure than Mr. Lilwall's present salary.

Damages for Lost Cows

At the Manchester Assizes recently Mr. James Knowles, a farmer, of Edgworth, was awarded £135 damages and costs against Mr. William Meredith, Egerton. According to the *Darwen News* the claim was in respect of the "electrocution" of two of the plaintiff's cows, reduction in value of a third cow, loss of milk and cost of work done and materials supplied to put the plaintiff's electrical installation in the condition in which it should have been if it had been installed in accordance with an agreement with the defendant.

The accident occurred when the winding of an electric motor driving a pump failed and caused electricity to pass to the cows' drinking bowls. The plaintiff contended that if the

system had been efficiently earthed the cows would not have been killed. After new earthing arrangements had been put in by the Turton U.D.C. a similar motor failure caused no damage.

Plants Exports Justified

Speaking at a meeting last week, Mr. Marquand, Paymaster-General, answered critics of the Government's policy of allowing generating and industrial plant to be exported when there was urgent need for it in this country. He said that we could not pay for our imports of food and raw materials merely with non-essential goods. Of the machinery and equipment exported Empire countries took 67 per cent of the electric motors, 63 per cent of the mining equipment and 68 per cent of the locomotives. These exports could not be substantially reduced without adverse effects upon the interests of these Empire countries.

As regarded electrical generating plant, British countries received 42 per cent and about 24 per cent went to Russia in fulfilment of contracts made during the war. In return for this we had arranged to receive timber from Russia.

No 1951 International Exhibition

Sir Stafford Cripps, in a written reply to a Parliamentary question last week, stated that the Government considered the holding of a great international exhibition in London in 1951 to be impracticable because of the strain which its preparation would impose on our limited resources. It was hoped, however, that there would be some kind of national display to mark the centenary of the Great Exhibition of 1851. The possibility was being considered of advancing the project for the erection of a permanent centre for the British Industries Fair recommended by the Ramsden Committee on exhibitions and trade fairs.

E.P.T. and Rating

The Court of Appeal, by a majority, has ruled that excess profits tax should not be deducted in fixing the rateable value of an undertaking assessed on a profits basis. The point arose in connection with the assessment of the undertaking of the South Somerset & District Electricity Co., Ltd., by the Yeovil Rural District Council. In arriving at the assessment the R.D.C. took the profit before the deduction of E.P.T.

The Appeals Committee of Somerset Quarter Sessions rejected this and the Committee's decision was confirmed by a Divisional Court. Two members of the Court of Appeal, Lord Justices Tucker and Cohen, gave judgment in favour of the R.D.C. and remitted the matter to Quarter Sessions. Lord Justice Tucker said that it was impossible to distinguish between E.P.T. and income tax, but that while it was wrong to deduct the whole of the tax in ascertaining the rateable value, the existence of the tax was a factor to be considered when arriving at the appropriate share of the profit to be allowed to the tenant.

Lord Oaksey, dissenting, held that the Divisional Court was right in regarding a previous judgment as applicable in this case.

Higher Copper and Lead Prices

For the third time this year the price of copper has been raised. The Ministry of Supply announces that as from March 31st the maximum price of high conductivity electrolytic copper is £137 a ton (£10 increase). The price of lead (which was increased on January 1st) is also higher. For good soft pig metal the maximum price is raised from £70 to £90 a ton. There are corresponding increases in the cost of other descriptions of the two metals.

Tin Price Increased

The Ministry of Supply has announced that from March 29th the price of tin metal of minimum 99 per cent up to under 99·75 per cent tin content, has been increased from £380 10s. per ton to £437 per ton (f.o.b. U.K. port or delivered U.K. consumers' works). All other prices will be varied correspondingly.

Holders of valid licences to purchase tin metal granted on or before March 28th may, on application to the Directorate of Non-Ferrous Metals, can cover themselves by purchases against such licences up to and including April 3rd at the March 28th selling price.

Annual Holidays

The Anchor Works, Leigh, of the British Insulated Callender's Cables, Ltd., will be closed for the annual holidays from July 5th to July 12th, the Prescot and Helsby Works from July 26th to August 4th and the Willenhall Foundry from June 28th to July 7th, all dates inclusive. A skeleton staff will deal with urgent inquiries. The Erith Works, Belvedere, Kent, will not be closed as holidays will be staggered.

Trade Announcements

The "Beeantee" Illuminations (London), Ltd., has moved to 69, Upper Street, Islington, London, N.1, and asks for manufacturers' catalogues.

The A.D. Davidson Electric Co. has transferred its offices to 62, Granville Street, Birmingham, 1 (telephone: Midland 2865).

Change of Address

The offices of the British Internal Combustion Engine Manufacturers' Association are now at 6, Grafton Street, London, W.1, and the telephone number is Regent 5107–8–9. The registered telegraphic address is "Intcomenas, Piccy, London."

Public Transport and the Trolley-bus

By J. H. Cansdale, M.I.E.E.

THE electric tramcar, when it enjoyed a boom period during the first decade of the present century, had the great advantage that, as a road vehicle for public service, it was, at that time, practically unopposed. In consequence, tramways were installed very widely (though not always wisely), and later, when motor-bus competition became very keen, many succumbed. Since 1925, when the number of tramcars in Great Britain reached a peak of 14,700, there has been a steady decline and the total is now less than half the peak figure; but during the war, the decline was checked, otherwise the number would probably by now have been reduced to less than 5,000. It is obvious, however, that many of the old trams now running will have to be scrapped soon and the majority will probably be replaced by other forms of transport.

The Square at Bournemouth during the change-over from tramcars to Sunbeam - B.T.H. trolley-buses is shown in the picture at the top of the page

During the five years before the war, the number of trolley-buses placed in service in Great Britain was approximately 2,000; this compares with 3,000 tramcars which were scrapped during the same period. This proportion is high because the change-over by the London Passenger Transport Board in North London took place largely during this period; generally, tramcars which are scrapped are more often replaced by motor-buses than by trolley-buses. Even so, there are now approximately 4,000 trolley-buses in service in Great Britain and this number is steadily increasing, due as much to expansion of existing undertakings as to new installations. Of the thirty-three trolley-bus undertakings in Great Britain all but ten have increased their fleets during the past two years or are about to do so.

At one time the trolley-bus was strongly advocated on the grounds that it used home-produced power and was not dependent upon outside sources of supply, but unfortunately the situation has now changed and the present emphasis is upon the conservation of coal and power. On account of this new emphasis, caused by the temporary shortage of coal, there is a tendency to rule out the trolley-bus and to assume that the motor-bus is the only public service vehicle which can now be considered. This idea is very prevalent at the present time and there is a grave danger that many places will be supplied with motor-buses which would be much better served by trolley-buses.

It is not suggested that the trolley-bus and the motor-bus are interchangeable; they should rather be regarded as complementary.

A combination of both forms of transport, as for example at Bournemouth, provides the most satisfactory transport system in an area which includes both urban and rural routes. It is often claimed for the motor-bus that it can do everything that the trolley-bus can do, and much that it cannot do as well. On the other hand, the trolley-bus merely claims that, in its proper sphere, it has outstanding advantages over all other forms of road transport.

Operating Costs

The essential differences between the trolley-bus and the motor-bus make it extremely difficult to compare them on level terms. For example, trolley-bus service usually involves six to eight stops per mile, whereas the motor-bus seldom exceeds four stops per mile. Factors such as this must be taken into account when comparing the two vehicles and it is useless merely to compare the operating costs of both types, even when they are run by the same authority. What really matters is the operating ratio (ratio of operating costs to revenue), since this gives a true indication of economic usefulness.

Several statements have recently been made comparing the operating costs of trolley-buses and motor-buses, usually to the detriment of the former, the inference being that they are inferior, but in no case have the corresponding revenue figures been stated. It is not unusual for the trolley-bus to cost more per vehicle-mile than the motor-bus but the higher revenue usually more than offsets this. In one instance where the trolley-bus was said to be more expensive at the present time by about 1·0d per vehicle-mile, it was shown that the same was true in 1939, when trolley-buses showed a profit of 3·7d per vehicle-mile compared with 1·5d for the motor-bus. The trolley-bus was actually carrying 50 per cent more passengers per mile.

The average operating ratio for all trolley-bus undertakings in Great Britain for a number of years before the war was fairly constant at about 75 per cent, a figure considerably lower than the average for motor-buses. Although this ratio may not be obtainable now, the effect of cost increases will be approximately the same for both forms of transport, leaving the trolley-bus still with an advantage.

The difficulty owing to the present power position is obviously only temporary and, even though coal may continue to be in short supply for some time, eventually electric power will be available without restriction; the proposals in hand for atomic energy installations will ensure this regardless of the coal situation. In planning for future transport needs, this fact must be taken into account, since the supply of oil, though apparently plentiful at the present time, may become very uncertain, depending as it does almost exclusively on imports from overseas. The advantage of using home-produced power, though overshadowed by the immediate fuel situation, is a very real one and must not be overlooked.

The advantage of the traction load to the power station is also considerable, since the load factor is improved by it, power being used at a maximum at periods when the industrial load is reduced.

The schedule speed of a vehicle is its average speed in service, including stopping time, and it is a measure of its effectiveness as a passenger-carrying vehicle on a particular service. On routes requiring six or more stops per mile the schedule speed depends very largely on the rates of acceleration and braking, and this is where the trolley-bus shows up to advantage. The largest vehicle can accelerate up to 15 m.p.h. in 5 sec and to 25 m.p.h. in 15 sec, and can maintain a schedule speed of 14 m.p.h. with six stops per mile. The ability to draw almost unlimited power from the overhead electrical system enables the trolley-bus to maintain this high rate of acceleration, whereas the motor-bus is limited entirely to its own engine power which has practically no overload capacity. With the higher schedule speeds possible with trolley-buses (from 10 to 20 per cent above that of the motor-bus on an equivalent service) fewer vehicles can be used; this usually more than offsets the rather higher initial cost of the trolley-bus.

Longer Life and Lower Maintenance

The life of a motor-bus is estimated variously at from five to ten years, compared with a trolley-bus life of from ten to fifteen years. Even these maxima have frequently been exceeded during recent years, but the maintenance cost of a motor vehicle increases very sharply after its economic life has been exceeded; this does not apply in the same degree to a trolley-bus. The difference is between the engine and gearbox on the one hand and the electrical equipment on the other. Not only is the economic life of the engine less than half that of the electric motor but, due to the absence of engine

vibration and gear changing shocks, the chassis maintenance of a trolley-bus is also reduced. The simple and robust nature of the electric motor and its control makes for easy maintenance and, although the first cost of a trolley-bus is greater than that of a motor-bus, the lower maintenance and longer life more than compensate for the difference.

Passenger Comfort

It is in passenger comfort that the trolley-bus scores very heavily, though it is not possible to assess these advantages precisely in terms of £ s. d. Acceleration is smooth and progressive and there are no sudden changes of torque such as are experienced during gear-changing on a motor vehicle. The vibration, so often associated with any form of reciprocating engine, is absent and the trolley-bus motor gives a perfectly even driving torque.

The trolley-bus is the most silent of all public service vehicles and even the high-pitched note of the trolley wheel has now been eliminated by the general adoption of the slider shoe collector with carbon inserts. In places where trolley-buses and motor-buses are running on the same route, passengers will frequently wait for the trolley-bus in preference to the motor-bus, preferring the smooth travel of the electric vehicle. Another advantage, which affects perhaps other road users and pedestrians more than the actual passengers, is the complete absence of fumes.

Under the present regulations in this country, the trolley-bus can be built half a ton heavier than other forms of road passenger vehicles (the maximum being 12½ tons for the two-axle, and 14½ tons for the three-axle trolley-bus) and most of the extra allowance can be utilized for passenger accommodation. This advantage of more seats adds to the gain resulting from the higher schedule speed of the trolley-bus.

From the driver's point of view, the trolley-bus is a very simple vehicle to drive, since acceleration is controlled by a single pedal and there is no gear changing or clutch operation. Depot work is simplified as there are no radiator, fuel tank or engine sump replenishments to be made and the servicing required for the motor and control is very much simpler than for an engine and gearbox.

It is often alleged against the trolley-bus that it is route-bound and it must be admitted that this is true; but even so, this is only a very slight disadvantage. Trolley-buses normally run through built-up areas where such routes are usually well established and very seldom need to be changed. The trolley-bus, unlike the tramcar, can deviate considerably from its normal course and can by-pass most road obstructions without difficulty. Battery manœuvring control is now frequently fitted and with this the vehicle can be diverted from its normal route for a short distance under its own power in order to avoid a completely blocked road.

Another disadvantage attributed to the trolley-bus is that it depends upon a central power supply and, if this fails, then the complete system may be put out of operation. In practice, however, a complete hold-up of a trolley-bus system is extremely rare. It was a marked feature of the trolley-buses in North London that they were kept running throughout the war; only in exceptional circumstances was a route put out of action and services were very quickly restored even after serious air-raid damage. This disadvantage might be alleged equally of any service which uses electric power.

Objection to trolley-buses on the ground that the poles and overhead wires are unsightly is perhaps understandable on roads where trams have not previously been running, but it is a matter of opinion whether they are a serious menace to local amenities. Another alleged disadvantage is the complaint that trolley-buses are too silent and therefore cause more accidents.

A British Development

The trolley-bus is largely a British development and hitherto Great Britain has taken the lead, both in design and in the number of vehicles in service. In the United States, the single-deck trolley-bus has been gaining ground rapidly and is now enjoying great popularity, the number in service there approaching the number of those operating in this country. In Canada, South Africa, Australia and New Zealand numbers are also increasing and large orders for British vehicles are in hand for the last three countries. It is in the interests of public transport in Great Britain that the trolley-bus should be given a fair chance, since it has already proved its worth in many places. Wherever it has been installed, it is popular, both with operating authorities and the travelling public, and, in planning passenger transport for the future, due account should be taken of its capabilities, particularly in those places where electric tramcars have been operating.

NEW BOOKS

Diversity of Subjects

Direct and Alternating Currents. By E. A. Loew. Pp. 748; illus. and index. McGraw Hill Publishing Co., Ltd., Aldwych House, London, W.C.2. Price 25s.

This well-established elementary work for engineering students, which was last revised in 1938, has now reached a third edition. Explanations relating to fundamental principles and electric circuits have been clarified and amplified and information relating to recent developments and also to such matters as permanent magnet materials, thermal and rectifier-type instruments, silicone resins, voltage regulation and synchronous motors has been introduced. By the judicious elimination of old material, however, the size of the book remains very much what it was.—C.O.B.

Electrical Protective Equipment. By T. H. Carr. Pp. 42; figs. 34. Draughtsman Publishing Co., Ltd., 96, St. George's Square, London, S.W.1. Price 2s.

This pamphlet deals with the principal methods now in use for protecting power systems. It is mainly descriptive, commencing with commentaries on current and voltage transformers, relays, trip coils and fuses, before proceeding to overcurrent, leakage, differential (balance) methods and the protection of mining equipment. Sections are included on the advantages of system earthing and the three main schemes of bus-bar protection, and the Buchholz device is explained. Each section is illustrated with circuit diagrams.—W.O.F.

Reference Data for Radio Engineers. By W. C. McPherson. Pp. 175. Standard Telephones & Cables, Ltd., Connaught House, 63, Aldwych, London, W.C.2. Price 5s.

This is an enlarged edition of the original, which was intended for the use of the company's own staff; successive calls for reprints since its compilation in 1942 are indicative of the general demand for this book of formulæ, graphs and tabulated data to which one can easily refer in all ordinary emergencies. Although necessarily restricted, the scope is not narrow; this edition includes wholly new and greatly expanded sections, that devoted to mathematical tables being more comprehensive than is usual in publications of this kind.—W.O.F.

Marginal Costing. By F. C. Lawrence, M.C., B.Sc.Tech., A.M.I.E.E., and E. N. Humphreys, A.C.I.S. (117 pp.) Macdonald & Evans, 8, John Street, Bedford Row, W.C.1. Price 12s. 6d.

Marginal cost is defined in the first chapter of this book as "the amount, at any given volume of output, by which aggregate costs are changed if the volume of output is increased or decreased by one unit." It is another term for direct cost—material, labour and other specific charges related to the particular article. The method of arriving at marginal cost is explained and the rest of the book is devoted to showing how it is applied in the running of any type of business from the simple to the complicated.

Chapters cover the "technique of total costs"; the basic data of costing; the determination of marginal costs; final accounts; marginal trading and profit and loss accounts; monthly accounts; stock and work in progress valuation; production, sales and general management; and marginal costs in relation to price fixing.—J.H.C.

Anthology of Errors. By A. Gowans Whyte. Pp. x + 70. Chaterson, Ltd., 5, Johnson's Court, Fleet Street, London, E.C.4. Price 5s. net.

Even the literary stylist can sometimes err in the use of words and be guilty of incorrect phraseology. In this little book the author has gathered together examples—mostly from the work of professional writers—which have appeared in books, newspapers and periodicals.

The book should prove entertaining to the general reader and serve to guard the professional writer against such literary lapses as those given in its pages.

Annual Report of the Smithsonian Institution. Pp. 484 with index. Government Printing Office, Washington, 25, D.C., U.S.A. Price $1·75.

In addition to the main report for the year ended June, 1945, with an appendix of ten sectional reports, this bound volume contains twenty-three excellently illustrated special articles on a variety of subjects.

Also "The First Hundred Years of the Smithsonian Institution" (pp. viii + 64, illustrated), which is an account of the growth of a national scientific institution, founded by an Englishman, which has become an American tradition. Relatively few people know the origin of this organization, which provides information about anything under the sun, or of the volume and variety of its research.

Engineering Radiography. Anonymous. Pp. 57; figs. 38. Emmott & Co., Ltd., 31, King Street West, Manchester. Price 2s. 6d.

This pocket-size booklet is No. 26 in the *Mechanical World* series of monographs. Outlines of the principles involved, the means of generating X-radiation and the operation of the equipment take up the first thirty pages. Four pages are given to an explanation of the differences between X-rays and gamma-radiation, ten pages to crystal analysis and methods, while the last dozen pages are devoted to applications of these methods of examining various materials.

Emphasis on Export Trade

Need for Reducing Shipping Costs

By John C. Hancock

WHILE the demand for British goods overseas is almost insatiable at the moment, the exporter cannot afford to ignore the question of expense in shipping his wares abroad. It is necessary, therefore, and will become even more necessary in the future as competition increases and the foreign buyer becomes more selective, to cut down shipping costs to the absolute minimum and attempt, in some measure, to off-set the increasing burden of present-day overhead charges. By exercising an extra degree of care and attention the exporter can to some extent save himself considerable expense, and at the same time avoid incurring unnecessary charges on his export orders. If he notes some of the more general advice given in the following paragraphs, other ways and means of reducing shipping costs will probably occur to him through his specialized knowledge of his own particular line of business.

It must not be lost sight of that in addition to sea-freight there are such ancillary charges to be considered as wharfage and porterage, and charges for presenting to H.M. Customs at the port of shipment—in the case of licensed goods or goods exported under drawback. If a forwarding agent is employed to handle the exporter's shipping traffic, there is the agency fee to be taken into account and this can vary from 2½ per cent of the freight charges to as much as 10 per cent, while on top of that is the cost of supplying and preparing bills of lading.

Shipping Small Consignments

The shipping companies are empowered to make a minimum charge for each consignment. For instance, suppose that a package weighing 3 cwt is to be shipped abroad, the rate of freight on which is 120s. a ton, the actual cost *pro rata* would amount to 18s. Owing to the operation of the minimum freight rule, which could amount to something in the region of £2 for such a consignment, it will readily be seen that almost 7 cwt could be sent as cheaply as 3 cwt. As a minimum charge is also levied for the service of wharfage and porterage it clearly is not economical to send goods overseas in small lots. The golden rule is to avoid a minimum freight charge.

In an attempt to please his customer, the exporter will often dispatch the goods as soon as they become ready, thus making two or three shipments when one might have done. At first sight that may appear to be enterprising, but apart from the fact that the importer will have to attend to the same number of clearances through the customs at his end, the exporter may at the same time incur two or three minimum freight charges. It is, of course, not always possible to avoid the shipment of small consignments, in which case the minimum freight question can sometimes be surmounted by shipping the goods on a parcels ticket. In this event the value of the goods must, as a rule, not exceed £5.

Accuracy in Documentation

The exporter himself can do a great deal to avoid being overcharged by observing strict accuracy when furnishing the shipping company with particulars of his goods. Therefore, the gross weight as well as the dimensions of each package forming the consignment should be set out distinctly on the shipping note. Even when these points are observed, not all shippers take the trouble to attach to their bills of lading complete shipping specifications, thinking no doubt that the entry of the particulars on the shipping note is in itself sufficient. When the exporter realises that the dock office of the shipping company makes a return of goods received for shipment and that freight charges are based on the particulars received from the docks, he can perhaps visualize the possibility of error occurring between the docks and the "office." If, then, the exporter has declared his packages correctly on both shipping note and bill of lading specification and a package, upon arrival at the dock, is weighed or measured incorrectly, it would be noticed at once that the shipper's particulars differed from the wharfinger's. As a result, the package would be re-weighed or re-measured and if found to tally with the details declared by the shipper, the correct particulars would be re-established.

It is equally important that the contents of the packages shall be declared so that

the lowest rates possible are applied to the exporter's goods. A package is freighted according to the highest rated article it contains. One containing, say, electric lighting fittings and porcelain insulators would be charged at the rate applicable to the former even though the lighting fittings comprised a very small fraction of the whole. There is often a tendency to describe consignments in general terms such as " electrical goods," but as this term can be made to cover anything from electric fires to resinous insulating compound it is a somewhat vague description. Since the freight rate on electrical goods is very high the exporter should, where possible, refrain from shipping his goods under this description.

Selection of Description

No opportunity should be lost in describing goods in such a manner as to obtain, legitimately, the most favourable rates, though care should be taken to see that the contents of the export packages are not intentionally declared incorrectly. For instance, there is a separate rate covering cast-iron goods and, to take a random example, while cable joint boxes are one class of electrical goods they are at the same time generally made of cast iron. As the freight rate on cast-iron goods is considerably lower than that for electrical goods the shipper is quite within his right in claiming the more favourable freight rate, provided they are correctly declared.

There are many other instances where lower rates can be claimed by stating the actual description of the goods rather than by giving a general description. By investigating the question from the exporter's own particular angle it may well be that he will be able to make substantial reductions in his freight costs, merely by the exercise of a little extra forethought. Thus, the time spent in comparing his own goods with the descriptions given in the shipping companies' freight tariff can scarcely fail to be advantageous to the shipper.

Economical Packing

As pointed out previously, a package is charged for freight according to the highest rated items it contains even though such items may comprise but a small proportion of the total. While it is always advisable to avoid packing high-rated and low-rated goods together in the same container it is not safe to lay down a hard and fast rule that they should, in consequence, always be packed separately. For one thing the supply position, and the price, of timber needed for the construction of packing cases generally forces the exporter to pack his goods as best he can. On the other hand if an overseas order is packed in two or more cases, when one would have done, with the object of avoiding the payment of " top rate " on the whole, it may happen that owing to the increased amount of packing materials used and the total weight or measurement being correspondingly increased, there may be no net saving at all.

It does, however, generally pay to pack all licensed goods together, though not necessarily separately from " free " goods, i.e., goods not subject to export control. The reason for this is that licensed goods have to be released by the Customs officials at the port of shipment and the cost of " presenting to H.M. Customs " has to be borne by the exporter.

Shippers to Australia and New Zealand now have an opportunity of economizing in their packing costs by using fibreboard containers instead of the heavier and more costly wooden packing cases. It was recently announced that the Australian and New Zealand freight conferences now agree to the issue of clean bills of lading covering goods packed in standard fibreboard containers.

Soil Heating in France

From Our Paris Correspondent

ENCOURAGED by the nationalized electricity producing and distributing company, Electricité de France, many French agriculturalists and horticulturalists are turning to electricity as a method of soil heating. Users are unaffected by electricity restrictions as power is only used during off-peak hours at night. Special equipment for heating soil has been studied, as well as its effect on the electricity networks.

Two types of apparatus are available. In one, an aluminium tube protects the wiring; 1½ sq metres is heated, the apparatus requiring 250 W. The second type consists of a cable protected by a flexible covering.

Electric soil heating is remunerative, since alternative methods are far more expensive, without taking into account the equipment, and the coal or fuel oil which are hard to obtain. The only difficulty is securing sufficient cable; licences must be obtained, or the corresponding quantity of lead surrendered. This has restricted the scale of soil heating. Iron wire cable operating at 24 V has been suggested for greater areas.

Prefabricated Bungalows

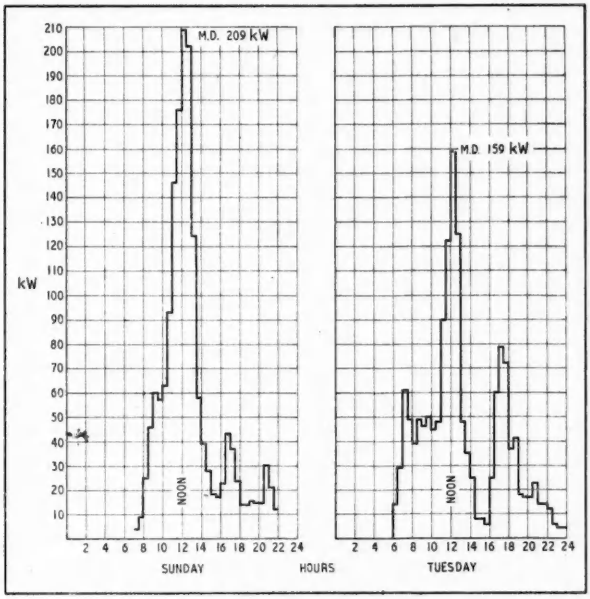
Investigation of Load Characteristics

AN investigation into the load characteristics of one hundred prefabricated bungalows of the "Spooner" type which have been erected at Grantham was carried out from October 15th to November 2nd inclusive. The electrical equipment of each was as follows:—lighting, five 5-A socket outlets, cooker (with oven, one hot-plate and grill-boiler), plug for electric kettle (kettle not supplied by the undertaking), 3-kW wash-boiler and 2-kW immersion heater (the hot-water system is also served from the solid-fuel fire in the living room). Provision is also made for electric refrigerators.

Connected to current transformers fitted in the feeder pillar supplying the housing estate were a recording ammeter in each phase and one three-phase four-wire integrating watt-hour meter with Merz maximum-demand indicator having a 30-min time interval. Thirty-four bungalows were connected between red phase and neutral and thirty-three between each of the other phases and neutral.

The readings of the recording ammeters were averaged for each half-hour and converted to kilowatts on the assumption that the power factor of the load was unity and that the average voltage of the supply was 230 V. The sum of the half-hour demand values on the three phases (calculated as above) was then plotted against the hour of the day. As a check on the sum of the calculated three-phase half-hour demand values, the daily reading of the Merz maximum-demand indicator was found to be within 1 per cent.

The accompanying load curves show that the highest load, 209 kW, was registered on a Sunday between 12 and 12.30 p.m. (October 20th) and that the highest load registered on a week-day (Tuesday, October 29th) was 159 kW between 12 and 12.30 p.m. The maximum simultaneous instantaneous amperes on the different phases were as follows:—Sunday: Red, 380; yellow, 284; blue, 376; the equivalent m.d. was therefore $1{,}040 \times 230 = 239$ kVA. Tuesday: Red, 316; yellow, 152; blue, 230; the equivalent m.d. was therefore $698 \times 230 = 160$ kVA. The after-diversity maximum demand per bungalow on the Sunday was thus 2·39 kW for the instantaneous value and 2·09 kW for the 30-min value. For the week-day load, the after-diversity maximum demand per bungalow had an instantaneous value of 1·6 kW and a 30-min value of 1·59 kW.



Sunday and week-day load curves

The average daily consumption per bungalow was 7·69 kWh. The average after-

diversity maximum demand for the 34 bungalows connected to the red phase only on Sunday was 2·6 kW, instantaneous, and 2·2 kW, 30-min, and for the week-day load as 2·2 kW, instantaneous, and 2·0 kW, 30-min. The instruments have been left in circuit and no higher maximum demand has been registered since the period taken for this test. We are indebted for this information to Mr. N. F. Marsh, chief engineer and manager of the Mid-Lincolnshire Electric Supply Co., Ltd.

Forthcoming Events

Tuesday, April 8th.—LIVERPOOL.—Corporation Electricity Showrooms, Whitechapel, 6 p.m. Illuminating Engineering Society (Liverpool Centre). "Street Lighting," by J. M. Waldram.

Wednesday, April 9th.—EDINBURGH.—Heriot-Watt College, 6 p.m. I.E.E. Scottish Centre. Annual general meeting. "Comparisons between Gas and Electricity on the Basis of Coal Economy," by P. Schiller.

Electricity Department's Showroom, 127, George Street, 7.30 p.m. Edinburgh Electrical Society. Annual general meeting.

BIRMINGHAM.—Grand Hotel, Colmore Row, 7 p.m. Electrical Power Engineers' Association (Midland Technical Group). "Some Problems of Modern Boiler Control," by W. Szwander.

Thursday, April 10th.—LONDON.—Institution of Electrical Engineers, 5.30 p.m. "Commercial Development of Electricity Supply as a Consumer Service," by C. T. Melling.

MANCHESTER. — Engineers' Club, Albert Square, 6 p.m. I.E.E. North-Western Radio Group. "The Design of High-Fidelity Disc-Recording Equipment," by H. Davies.

Engineers' Club, Albert Square, 6.30 p.m. Women's Engineering Society (Manchester Branch). "Television," by N. H. Searby.

College of Technology, Sackville Street, 6 p.m. Illuminating Engineering Society (Liverpool Centre). "Lighting in Coal Mines," by W. J. W. Ferguson.

ST. AUSTELL.—Faraday Hall, South Street. I.E.E. Devon and Cornwall Sub-Centre. "Localization of Faults in Low-Voltage Cables with special reference to Factory Technique," by J. H. Savage.

Friday, April 11th.—EDINBURGH.—North British Station Hotel, 12.30 for 1 p.m. I.E.E. Scottish Centre. Presidential visit and luncheon.

LONDON.—Oak Restaurant, High Street, Kensington, 7.30 to 11 p.m. I.E.E. London Students' Section. Spring dance.

Saturday, April 12th.—BOURNEMOUTH.—I.E.E. Southern Centre, 3 p.m. "Engineering Principles Applied to the Design of Domestic Water-Heating Installations of the Solid-Fuel/Electric Type," by R. Grierson and Forbes Jackson.

MANCHESTER.—Engineers' Club, 2.30 p.m. I.E.E. North-Western Students' Section. Short papers afternoon.

CARDIFF.—Association of Mining Electrical and Mechanical Engineers (South Wales Branch), 5.30 p.m. "Considerations in the Design of Electric Winding Engines," by T. A. Hughes.

LEEDS.—Hotel Metropole, 3 p.m. Association of Mining Electrical and Mechanical Engineers (Yorkshire North-West Branch). Annual general meeting. (Amended notice).

Monday, April 14th.—BIRMINGHAM.—Midland Institute, 6 p.m. I.E.E. South Midland Centre. Faraday Lecture by J. Hacking.

CARDIFF.—South Wales Institute of Engineers, 5 p.m. I.E.E. Western Centre. "Commercial Development of Electricity Supply as a Consumer Service," by C. T. Melling.

Tuesday, April 15th.—LONDON.—Institution of Electrical Engineers (Radio Section), 5.30 p.m. Discussion on "Does Standardization conflict with Progress?", opened by J. W. Dalgleish.

Lighting Service Bureau, 2, Savoy Hill, W.C.2, 6.15 p.m. Association of Supervising Electrical Engineers. "Light and Colour, as Applied to Works Equipment," by W. Robinson.

MANCHESTER.—Engineers' Club, 6 p.m. I.E.E. North-Western Measurements Group. "Calibration of Uniform-Field Spark-Gaps for High-Voltage Measurement at Power Frequencies" and "The Design of an Ellipsoid Voltmeter for the Precision Measurement of High Alternating Voltages," by F. M. Bruce.

BELFAST.—Queen's University, 6.45 p.m. I.E.E. Northern Ireland Centre. "Recent Progress in the Design of the High-Voltage Overhead Lines of the British Grid System," by W. J. Nicholls.

SOUTHSEA.—Kimbells' Restaurant, 7 p.m. I.E.E. Southern Centre. Annual dinner-dance.

Thermometals

A technical booklet of 45 pages including tabulated and graphical data on temperature-sensitive bimetals produced by the H. A. Wilson Co., U.S.A., is being issued free of charge by Henry Wiggin & Co., Ltd., Wiggin Street, Birmingham, 16, through whom these metals are obtainable in Britain and Europe. The object of the booklet is to provide information about the properties of the metals in a manner that will assist designers of thermostatic devices to choose the most appropriate grades, forms and sizes for particular purposes.

RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

Midget Cooker

A SMALL cooker devised by the Design Group, Ltd., is being made by BRITISH DIAMIX, Ltd., Metrum Works, Beatty Street, Camden Town, N.W.1. It is controlled by push-button switches and, although only 16 in. long by 11 in.

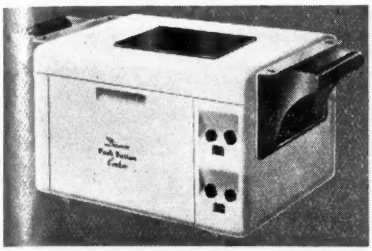


Table cooker (2,750-W loading)

high by 12 in. deep, has a spacious oven. The rectangular boiling plate is loaded to 1,750 W, its under surface forming a grill when the sliding reflector tray is removed. Under the floor of the oven is a separate 1,000-W element and special hinges allow the drop-down door to rest flush with the oven bottom when open.

Double-purpose lifting brackets made of anodised aluminium with black plastic handles need only be lifted off their rests and turned upside down to form a 14-in. hob extension. The exterior is finished in cream vitreous enamel.

Pilot Valve for Compressor Starting

An electro-magnetic pilot valve for starting air compressors is announced by BROOKHIRST SWITCHGEAR, LTD., Northgate Works, Chester. It consists of an operating magnet and a spring-loaded two-way valve arranged so that only after full speed has been attained can the compressor be connected to the receiver and load put on to the motor.

When the starter is operated (either through an automatic pressure switch or by hand) the magnet is energized and actuates the valve, which connects the receiver to the compressor unloading valve, opening the latter against the action of a spring or weight. This ensures that the compressor is exhausting into atmosphere and not charging into the receiver. When starting is completed, the pilot-valve magnet is de-energized and the valve is reset, shutting off the receiver pressure from the unloading valve and connecting the latter to atmosphere. In this way the unloading valve resets under the action of the operating spring or weight to connect the compressor to the receiver.

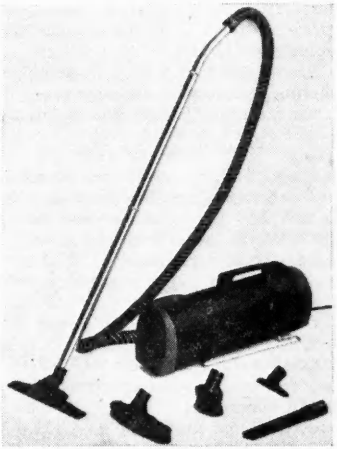
The valve is suitable for non-corrosive gases, for pressures up to 200 lb per sq in. Its overall dimensions are 14·5 by 10·5 by 11·25 in. and it is contained in a wall-mounting dustproof sheet-steel enclosure with hinged door. Conduit cable entry and pipe connectors are provided.

Anti-glare Shield

An anti-glare attachment for tubular fluorescent lamps is being made under the trade name of "Flonure" by COURTNEY POPE (ELECTRICAL), LTD., Amhurst Park Works, Tottenham, London, N.15. It is a simple louvred shield of light weight, formed of white enamelled aluminium to fit a standard 5-ft lamp, being fixed directly to the glass tube by snap-on clips without bolts or screws.

Cylindrical Suction Cleaner

To the suction cleaners made by HOOVER, LTD., Perivale, Greenford, Middx., there has been added a cylinder model, No. 402, with flexible suction hose and interchangeable nozzle attachments. Conversion to blowing may be effected simply by removing the hose from one end of the machine and inserting it in the other. The end-casing is specially shaped to enable the machine to stand upright, so saving storage space. A novelty is an emptying device. By



New Hoover suction cleaner

removing the end-plate and placing the cylinder vertically on a sheet of paper, the contents can be ejected by operating a plunger at the side of the casing.

Progress in Manufacture—V

Brush Company's Export Orders

STEADY expansion in its export trade is reflected in the large volume of overseas orders received or completed in the works of the **Brush Electrical Engineering Co., Ltd.** Those for generating plant exceeded 200,000 kW, a large proportion for oil-engine driven alternators. These included thirty-five sets of 100 kW and 220 kW for the Argentine Government, a number of 930 kW for industrial installations in Buenos Aires and others for the Channel Islands, the North of Scotland Hydro-Electric Board, Iceland, Australia, Finland and India, the operating conditions varying from arctic to tropical. Several 1,500-kW and 7,000-kW Brush-Ljungstrom steam turbo-alternators have been completed for the U.S.S.R. along with a 3,750-kW unit for a large steel works. A 7,000-kW set has been ordered for a public supply company in this country.

An order completed for South Africa covered six 600-H.P. 2·2-kV four-pole fan-cooled vertical squirrel-cage motors for driving ash-disposal pumps in the open at 3,500 ft above sea level; starting is by switching direct on to the line. Approximately 850,000 kVA of transformers were on order or completed, ranging from 20,000 kVA three-phase (33/11-kV) units for the C.E.B. at Neath, down to 5-kVA single-phase distribution transformers of surge-proof design for the Electricity Supply Board, Eire.

Transformers for Sweden

Over half of the transformer export orders were for Sweden, including two of 12,000 kVA (72/10·5 kV) for industries and several of 5,000 kVA for Stockholm municipal undertaking. There were also units of 10,000 kVA (110/21 kV) for Jugoslavia, three rated at 7,500 kVA (66/6·6 kV) for Calcutta and eight 4,000 kVA (88 kV) for the South African Electricity Supply Commission. In addition, 15,000-kVA and 10,000-kVA (33/11 kV) transformers are under construction for the Central Board at Cowes and Brighton respectively and four 5,000-kVA (33/6·6 kV) units for the Metropolitan Electric Supply Co. Many of these transformers incorporate on-load tap-changing gear. Numerous distribution transformers for Russia, Jugoslavia, India, South Africa and for the French Purchasing Commission have been shipped during the year. Research and development work has been done in connection with impulse-tested surge-resisting transformers for areas where lightning is frequent.

Switchgear production has been mainly devoted to control boards for engine-driven alternators and 11-kV 250-MVA ring-main and industrial designs. New ranges of

Radiator-cooled 2,100-V, 1,485 r.p.m. motor driving a 600-H.P. de-ashing pump at the Klip (South Africa) power station

medium-voltage vertical draw-out oil-circuit breakers up to 3,000 A and horizontal draw-out industrial ironclad switchgear have been developed. Switch-fuse distribution gear has been introduced to line up with existing flush-fronted circuit-breaker cubicles.

Power Position in Palestine

THE rapid growth in electricity demand and delay in obtaining new plant gave rise to a difficult situation in Jerusalem during the past few months. A correspondent reports, however, some easing of the situation, so that it has been possible to avoid further cuts in power supply. Extensions have been carried out at the power station of the Jerusalem Electric & Public Service Corporation, Ltd., the new plant including equipment flown specially from Britain.

The recent evacuation has had its effect in reducing power requirements to some extent. The power station is now in a security zone and special passes have had to be issued to personnel going on duty.

ELECTRICITY SUPPLY

Voluntary Load Reduction. Gas-Washing Plant at Fulham.

Bethnal Green.—CREDIT FOR CONSUMERS.—Electricity consumers are to receive a credit of about £20,000 on a full year's working. Domestic consumers will be the principal ones to benefit.

Bexhill.—REBATE FOR CONSUMERS.—Anticipating a profit of £5,874 for the year, the Electricity Committee recommends a 10 per cent reduction on accounts for the March quarter.

Blackburn.—LOAD REDUCTION PLAN.—Large industrial consumers in Blackburn district are supporting an extension of the electricity undertaking's voluntary load reduction plan to obviate a complete and compulsory shut-down during emergency periods. Mr. D. P. Welman, chairman of the District Committee for Industry, and Mr. R. H. Harral, the electrical engineer, called a conference on March 26th. Mr. Welman said he was originally asked to co-ordinate Blackburn, Preston, and Burnley on a basis of rearranged industrial hours, but he considered it wiser for the three districts to deal with their problems separately.

LIGHTING SCHEME.—The relighting of King George's Hall, Blackburn, to be carried out at a cost of £4,785, includes £1,760 for necessary rewiring. The switch arrangements will be centrally connected to a console type of automatic control.

Brighton.—33-kV RING MAIN.—The Electricity Committee is to proceed with the completion of the 33-kV ring main at a cost of £221,694.

Burnley.—ANTICIPATED DEFICIT.—Alderman Maxfield told the Town Council at a recent meeting that the Electricity Department forecast a deficiency of £16,000 this year, and a probable deficiency of £27,000 next year. The undertaking had over £82,000 reserves and in view of impending legislation it was considered preferable to utilize those reserves to meet the deficiency rather than increase charges.

Droitwich. — PROJECTED LIGHTING CHANGE-OVER.—The Town Council proposes to install electric street lighting in lieu of gas lighting.

East Ham.—DISTRIBUTION DEVELOPMENT.—The Town Council has approved estimates of £30,651 for the provision of 14 substations with switchgear, transformers, and extension of h.v. mains; and £32,153 for extension of underground l.v. mains in connection with the future development of the undertaking.

Fifeshire.—PROPOSED COUNTY RESPONSIBILITY.—The Cupar and District Council recommends the County Council to assume responsibility for supplies of electricity to all rural areas. A sub-committee suggested that, as water services were rated on the whole county, the supply of electricity should be similarly rated and the domestic and public charges for electricity in rural areas should not exceed the rates in urban areas. It was also recommended that the County Council should assist individual rural districts to introduce electricity and negotiate costs direct with the company responsible.

Fulham. —GAS-WASHING PLANT. — Gas-washing at the power station was discontinued during the war but is to be resumed. It has been agreed with the Central Electricity Board that the cost of new plant or the completion of existing plant shall be chargeable to capital and the cost of taking down such plant as has to be replaced owing to corrosion and damage during the war shall be charged to non-recurring revenue expenditure. Replaced assets are to be charged to capital and normal maintenance works against the cost of fuel. The Electricity and Lighting Committee says that it is not possible to estimate the cost of the new plant but has submitted a supplementary estimate of £200,000 as a first instalment.

Hammersmith. — JUBILEE CELEBRATIONS.—In connection with the Jubilee of the Corporation electricity undertaking it is proposed to arrange a reception and luncheon on June 21st with a dance and cabaret for the staff and employees in the evening. If it is permitted, the Town Hall and electricity showrooms will be floodlighted.

Islington.—REPAIR OF RADIO SETS.—Recently the Electricity Committee decided that the servicing and repair of radio sets should not be limited to sets sold by the Council. It has now arranged, however, that only sets sold by the Council shall be dealt with.

London.—J.E.A. PROPOSALS.—The Local Distribution Committee of the London and Home Counties Joint Electricity Authority has approved mains and service extensions at a cost of £30,657.

Poplar.—HIRE CHARGES.—The Electricity Committee recommends the increase of hire charges for cookers and wash-boilers from 10s. 6d. and 3s. 3d. to 18s. and 5s. a quarter respectively.

Overseas

Eire.—ELECTRICITY CUT SUSPENDED.—On March 5th the full industrial electricity ration was cut by 25 per cent. An improvement in the water-power situation has now made it possible for the Electricity Supply Board to suspend this restriction, the River Shannon having risen rapidly as a result of very heavy rain. The restrictions on the use of electricity for Dublin trams were removed on March 15th.

Seasonable Goods

Recovery of Loss Through Late Delivery

EVEN in the electrical business there are definite seasons for various classes of goods; bed-heaters and lighting fittings are examples. While there is some sale for such goods all the year round most of them are sold at particular times of the year. Hence it is customary for the electrical retailer to get in supplies before these periods.

Unfortunately the delivery of some of these goods is often held up long after the period for which they were intended and as a consequence the demand for them has fallen and they have been left on the retailer's hands. Has the trader concerned any redress, can he refuse delivery, or can he claim for loss of profit on these goods or damages to compensate him for the loss he has sustained through the arrival of the goods at an inappropriate time?

By F. E. Sugden,
A.C.I.S., Barrister-at-Law

It was held in a recent case that repudiation of a contract for the sale of goods, to be of any avail, must be accepted by the other party, and whether or not there has, in fact, been repudiation depends on the facts of each particular case. Where there is no market a buyer who to the knowledge of the seller has bought goods with a view to their re-sale, is, in the event of non-delivery, entitled to recover his loss of profit, such loss being in practice a certain percentage, fixed by the court, of the price agreed to be paid by the buyer to the seller. In the case in question this was fixed by the court at 10 per cent. A buyer who, to the knowledge of the seller, has bought goods with a view to re-sale, and who has contracted to re-sell the goods to a third party, but, owing to non-delivery, is unable to do so, may be granted a declaration that the seller is bound to indemnify him for anything which can be adjudged by a court of law to be due from him to the third party and can be handed to the seller.

Suppose a supply of electric heaters is ordered by a hotel which caters particularly for the Christmas period. If the goods are not delivered to the hotel by a specific date the hotel proprietors can claim against the electrical retailer for non-delivery of the goods. The trader, in turn, can claim against the wholesaler from whom he ordered the goods, provided he can show that it was the wholesaler's fault and not his own fault that the goods were not delivered in time to the hotel.

If the hotel proprietors go to Court, they can claim damages from the retailer for loss of profit during the Christmas period caused by the default. The retailer can also claim damages from the wholesaler for loss of profit because after all there is bound to be a percentage of profit on the goods.

If the retailer has had no claim made against him by the hotel proprietors but fears that he may have in the future, then he can ask the Court for an indemnity against the wholesaler, compelling him to pay any amount awarded against the retailer in any subsequent proceedings.

It may be asked if the wholesaler can be compelled to deliver the goods if he actually possesses them. The answer is in the affirmative. If the trader can show that the damages awarded by the Court would not compensate him for loss of sale by the wholesaler to the trader and secondly that the goods do exist, then the trader asks for "specific performance" of the contract. The Court is, however, loth to order specific performance of any contract if damages will compensate the person for injury through non-delivery.

In the computation of damages for loss of profit, where the sellers are in breach of a contract for the sale of goods the measure of damages to which the buyers are entitled is, as a general rule, the difference between the contract price and the market price at the time of the breach of contract. Where there is no market in which the goods can be obtained, the amount of damages recoverable is held to be a loss of profit, a figure which the Court fixes at a percentage over and above the purchase price, a percentage which varies in different trades.

New Polish Power Station.—A new power station is under construction at Jaworzno, an industrial centre in the Cracow Province. The power station will produce 100,000 kW and will have six Borsig boilers. Much of the plant will have to be imported from abroad, and turbo-generators of 35,000 kW each have already been ordered from Brown Boveri of Switzerland.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

The English Electric Co., Ltd.—Presiding at the annual meeting held on March 27th Sir George Nelson (chairman), after referring to the purchase of the whole of the share capital of Marconi's Wireless Telegraph Co., dealt with the present economic state of the country and the coal and power crisis. He said that they had done everything they could to meet the wish of the Government that they should assist the drive for exports by obtaining contracts from abroad for capital goods. They had had much success from that source, and together with the heavy home demand for all forms of power plant, their uncompleted order book, both in volume and value was higher than it had ever been, including the war period. They had embarked on important extensions to the works and had raised substantial new capital to pay for them. They had, however, met with many delays and disappointments in carrying out this policy. They had endeavoured to build houses for their employees, but their achievements in this respect had so far been extremely unsatisfactory. Their efforts in the last twelve months to obtain labour from the Government had resulted in the addition of under 300 men, whereas they needed several thousands to increase the output of heavy machinery. The works of their materials suppliers were similarly out of balance and from them they got only a partial allocation of standard materials where the demand exceeded the supply.

The accumulative effect of all these factors was to make the structure of production in the whole country unbalanced and inefficient. The Government and industry must ensure that the best possible use was made of the available labour and materials. At present we had, as a nation, oversold our production capacity, and we must see that by joint action we brought our commitments, week by week and month by month, more into line with our available resources.

With regard to the lack of coal, they had for many years tried to contribute to its conservation by designing steam turbines. Further they had carried out a great deal of research, and had designed and manufactured water turbines for nearly thirty years and Diesel engines for over forty years. They had also studied methods for the most efficient winning of coal and had designed and manufactured electrical equipment for the handling of coal both below and above ground and for winding. During the recent shutdown they had installed Diesel engines and other plant in the works affected by the stoppage, enabling production in many departments at least to be partially restored. Referring to work in hand, Sir George said that each manufacturing section had an excellent share of the total volume, and in their Research Department they were proceeding with work of high importance to the whole group with the extended research facilities now virtually complete.

Marconi's Wireless Telegraph Co., Ltd., held its annual meeting on March 27th when Sir George Nelson (chairman), who presided, said that in the year under review they had received orders for their normal peacetime products considerably exceeding the pre-war figures in volume, and the trend was steadily upwards. Of their orders 60 per cent of the value had been for export. Two major contracts had been received since the end of 1946. These were for four 100-kW short-wave broadcasters for the Spanish Government, and for £300,000 worth of communication equipment of standard design for the Chinese Government. Sir George then reviewed some of the orders received for marine, aviation, and broadcasting purposes.

The Marconi International Marine Communication Co., Ltd., held its annual meeting on March 27th when Sir George Nelson (chairman), who presided, reviewed the progress made by the company during the past year in the fields of Marine radio communication, navigational aid equipment and marine radar equipment.

North-Eastern Electric Supply Co., Ltd.—At the annual meeting last week Viscount Ridley (chairman) stated that a record quantity of electricity was supplied to consumers in 1946, namely 1,834 million kWh, but there was a decrease in the gross profit. Touching upon the subject of nationalization, he contended that the Bill failed in over-centralization of control, the separation in any area of generation from distribution, and the lack of financial autonomy for the Area Electricity Boards. It seemed that no area would be able to stand on its own and reflect its efficiency of operation or otherwise. These were grave defects, but it was not too late to hope that the Bill could still be modified and improved. The chairman referred to the additional generating plant which the company was installing—100,000 kW at Dunston and 120,000 kW at North Tees, and dealing with development he emphasized that it was no fault of the company that delays had occurred. In conclusion he spoke of the company's achievements.

Bournemouth & Poole Electricity Supply Co., Ltd.—In his speech at the annual meeting Sir Robert Renwick (chairman) commented on the plant position. He said that the country was at present short of 2 million kW capacity and only if they were lucky would they get an additional

750,000 kW by the end of 1948—substantially less than the anticipated increase in demand. The position, therefore, would be worse at the beginning of 1949 than it had been recently. One of the reasons why the country was starved of generating capacity was the encouragement by the Board of Trade of exports of such plant far in excess of the pre-war rate. Remedial measures which he suggested included the supply of suitable coal to power stations, which would provide an immediate increase in output from existing stations of some 357,000 kW.

City of London Electric Lighting Co., Ltd.—A plea that the Government should reconsider the terms of compensation—although he expressed the view that nationalization would bring serious dislocation to the industry at a time when it could hardly be more unfortunate—was made by Mr. J. B. Braithwaite (chairman) at the annual meeting. He said that the Government would surely be well advised even now to remove from the many people who must perforce be retained in the industry and upon whom particularly difficult work would fall in the next few years, the sense of injustice that otherwise would remain as long as they lived. The proper basis for compensation would be upon the lines—with due allowance for lossof future profits on the basis of net maintainable income—set out in the White Paper issued by the Ministry of Transport, which was then responsible for the electricity supply industry in April 5th, 1937. The companies, he said, did not ask for inflated or even generous values, but only for reasonable and fair compensation.

British Power & Light Corporation, Ltd.—Air-Commodore C. E. Benson (chairman) in a statement circulated with the accounts and submitted at the annual meeting, estimated that it would be necessary to spend something like £3,000,000 in order to bring their normal development up to date. Schemes had already been prepared, he said, involving an expenditure of approximately £500,000, with which they had not yet been able to proceed. Referring to the coal crisis, he mentioned that the North Wales Power Co. had spent a considerable amount of time and money in investigating the possibility of further developing the water-power resources of North Wales, and a report had been prepared by two eminent engineers. This was submitted to the appropriate Ministry more than two years ago, and it was a great disappointment to the directors that it had so far borne no results.

Midland Counties Electric Supply Co., Ltd.—Referring at the company's annual meeting to what he described as one or two of the more disturbing features of the Electricity Bill, Mr. W. Shearer (chairman) said that the members of the Central Electricity Authority and the fourteen Area Boards were all to be nominees of the Minister. The qualifications for these appointments which were enumerated did not, in the Bill as presented, purport to include a knowledge of electricity supply. That, to his mind, was a somewhat curious omission. He thought that the proposed areas were too large, and said that the separation of generation from distribution was condemned in most competent technical circles. Turning to the company's activities, he reported that work had been commenced on the site of the new generating station at Staythorpe and reasonable progress had been made. Provided no unforeseen circumstances intervened they hoped to be ready to commence generation by the date originally scheduled—October, 1949. Sales in 1946 amounted to more than 832 million kWh compared with 765 million in 1945, although sales to larger power users had not shown the increase they expected.

Midland Electric Corporation for Power Distribution, Ltd.—At the company's annual meeting Sir Alexander Roger (chairman) stated that sales of electricity rose by 6 per cent last year to 309 million kWh. Mentioning that the company was incorporated on June 23rd, 1897, he said that they were among the first to realize that the future of electricity supply, outside the large boroughs, would require wider boundaries than single municipal units. He reviewed the company's history and its achievements in the accelerated development of the area, the provision of a cheap and abundant supply of electricity, resulting in the removal of smoke from the one-time Black Country. Their jubilee year, he said, might see great changes in the industry, but they very much doubted whether the pioneering spirit, the progress and the service which they had contributed to the district would be equalled under the new control.

Lancashire Dynamo & Crypto, Ltd., reports a profit for 1946, after providing for taxation, of £107,446, as compared with £103,752 for the previous year, and after providing for depreciation, directors' fees and staff pensions it is proposed to pay a final ordinary dividend of 10 per cent (same), and a bonus of 7½ per cent (same) and at three-fifths of these rates on the new ordinary, following an interim of 5 per cent (same) and of 3 per cent on the new ordinary. The balance carried forward is £173,193 (against £139,131 brought in).

Venner Time Switches, Ltd., announces a forthcoming issue of 432,000 ordinary shares of 5s. each, which will be offered to existing ordinary stockholders at 9s. per share in the proportion of one new share for every 5s. nominal of ordinary stock held. The net proceeds of this issue will be applied towards repaying the temporary advances obtained from the bankers to meet greatly increased requirements in respect of permanent working capital. The offer is being guaranteed by Helbert, Wagg & Co., Ltd.

Consolidated Signal Co., Ltd.—Receipts for the year ended September 30th last were £30,325 (against £27,588 for 1944-45). After taxation, etc., and paying a dividend of 27 per cent

(against 28 per cent) on the ordinary stock, £1,467 (£1,111) is carried forward.

The Telephone & General Trust, Ltd., reports a total income for 1946 of £181,484, as compared with £175,356 for the preceding year, and a profit, before tax, of £126,345 (against £121,491). The final ordinary dividend is 5 per cent, again making 8 per cent for the year, and the dividend for the year on the "A" ordinary is also maintained at 8 per cent. The balance carried forward is £96,252 (against £88,070 brought in).

Waste Heat & Gas Electrical Generating Stations, Ltd., reports a profit for the year ended January 31st last of £10,981, as compared with £8,758 for the preceding year. The ordinary dividend for the year is again 8 per cent and £19,084 is carried forward.

The Shropshire, Worcestershire & Staffordshire Electric Power Co., reports a profit for the past year of £172,328 (against £166,515). The dividend on the "A" ordinary for the year is maintained at 8 per cent by a final payment of 4 per cent, and on the "B" ordinary at 5½ per cent by a final payment of 3 per cent.

The Wessex Electricity Co., shows a net profit for 1946 of £222,658 (against £155,193 for 1945). The final ordinary dividend is 3 per cent, making 5 per cent for the year.

The Urban Electric Supply Co., Ltd., reports a net profit for the past year of £22,153 (against £19,101). The final dividend is 4 per cent making 8 per cent for the year (same).

The Woking Electric Supply Co., Ltd., has announced a final dividend of 9 per cent (against 4½ per cent tax free), making 15 per cent for the year (against 7½ per cent tax free).

The Carmarthen Bay Power Station Co., Ltd., the subsidiary of the Llanelly & District Electric Supply Co., has applied to the Capital Issues Committee for permission to borrow funds for the erection of its new power station.

The South Wales Electric Power Co., is paying a final dividend of 4 per cent, making 6 per cent for the year (unchanged).

The Metropolitan Electric Cable & Construction Co., Ltd., is paying a final dividend of 10 per cent, again making 15 per cent for the year.

Joseph Lucas, Ltd., are paying an interim ordinary dividend of 2½ per cent (same).

The Cornwall Power Co. reports a net profit for 1946, subject to audit, of £18,013 (against £18,065).

New Companies

New Switchgear Construction Co., Ltd.—Registered March 20th. Capital, £5,000. Directors: T. F. Lister, A. de M. Browne, R. G. Jones and H. Birch (directors of Hackbridge & Hewittic Electric Co., Ltd.) and D. Hewitt. Regd. office: Wellesley Road, Sutton, Surrey.

Precision Electrical Products (Stockport), Ltd. Registered March 14th. Capital, £10,000. Manufacturers and repairers of, and dealers in, artificial lighting apparatus, etc. Directors: J. W. Stenton and T. Baldwin. Regd. office: Progressive Works, Lytham Street, Cale Green, Stockport.

Marples & Thomas, Ltd.—Registered March 21st. Capital, £2,000. To acquire the business of electrical contractors carried on by A. Marples and J. L. Thomas at Chesterfield as Marples & Thomas. Directors: A. Marples and J. L. Thomas. Regd. office: 87, Old Hall Road, Brampton, Chesterfield.

Wellclose Electric Co., Ltd.—Registered March 21st.—Capital, £1,500. To acquire the business of an electrical engineer and contractor carried on by K. E. Weston at 35, Wellclose Square, Stepney. Directors: K. E. Weston and Mrs. Annie J. Weston. Regd. office: 35, Wellclose Square, Stepney, E.1.

C. J. Wilkin & Son, Ltd. — Registered February 14th. Capital, £2,500. To acquire the business of electrical and general engineers and contractors carried on by Sydney A. Wilkin as C. J. Wilson & Son at 143, Woolwich High Street, S.E.18. Directors: S. A. Wilkin and R. S. Wilkin. Regd. office: 143, Woolwich High Street, S.E.18.

Electrical Appliances (Gt. Britain), Ltd.—Registered February 12th. Capital, £1,000. Subscribers: G. G. Bowyer, 14, Kingshill Road, Knowle, Bristol, and W. C. Jeffs, 42, Frank Street, Leicester.

Falmor Electrical Products, Ltd.—Regd. February 13th. Capital, £1,000. Electricians, mechanical engineers, etc. First directors: Major E. A. Woods, T. E. Morris, W. I. Falconar and H. V. Byford. Regd. office: 103, Cannon Street, E.C.4.

Liquidations

Hackbridge Electric Construction Co., Ltd., and the **New Switchgear Construction Co., Ltd.**—Winding up voluntarily. Liquidator of the Hackbridge Co., is Mr. R. G. Jones, Hersham Lodge, Walton-on-Thames, and of the New Switchgear Construction Co., Mr. H. Birch, Wellesley Road, Sutton, Surrey.

The liquidation of these companies is consequent upon the amalgamation of the Hackbridge Electric Construction Co., Ltd., the Hewittic Electric Co., Ltd., and the New Switchgear Construction Co., Ltd., under the title of Hackbridge & Hewittic Electric Co., Ltd., as reported in our last issue. The registration of a new company entitled the New Switchgear Construction Co., Ltd., is recorded in our "New Companies" section above.

Walbeck Electrical Co., Ltd.—Meetings April 21st at 11, Argyll Street, London, W.1, to receive an account of the winding-up by the liquidator, Mr. H. Goodier.

STOCKS AND SHARES

STOCK Exchange markets are in a state of uncertainty which can be attributed, as much as anything else, to the forthcoming Budget. During the past week or so, an unusually sharp drop in the price of Consols shook the confidence of other markets, with the result that a general fall occurred. Selling of British Government securities was countered by support which wiped out in some measure the previous losses. There was a fair recovery, but on balance, the changes are mainly in the downward direction.

Shares in the market for electrical manufacturing and equipment companies suffered in the previous *malaise*, rallying with other markets as "cheap" buyers came forward. The week preceding Easter is seldom one of pronounced activity in the Stock Exchange and until it is known what changes are in store, Stock Exchange markets can be expected to remain quiet and cautious.

Discounts on Compensation

Central Electricity Board stocks, which are in the same position for compensation purposes as those of the electricity supply companies, in the event of nationalization, remain at prices well below their estimated take-over value. In most cases, the discount is equal to about a full year's gross dividend. The 4 per cent stock dated 1959–89, for instance, can be bought at 109½. This is 4 points below the assumed compensation price. Prices of electricity supply ordinary stocks represent discounts of 4 to 5 per cent on their proposed compensation values.

The Week's Changes

Switchgear & Cowans have risen from 15s. to 20s. 6d. and so have recovered about half the relapse which followed the disappointing dividend announcement. Ward & Goldstone are up 1/16, at 52s. 6d. Otherwise, most of the week's changes in electrical equipment shares have been adverse to holders. General Electrics are 2s. 6d. down, at 92s. Telegraph Constructions at 54s. 3d. have lost 3s. Crompton Parkinsons at 31s. 6d., Laurence, Scotts, at 14s. 3d., and Chloride Electrical Storage at 90s. have declined by 1s. or more. Revo Electric at 49s. shed 2s. 3d. Johnson & Phillips held their ground at 80s., and other cable manufacturers' shares are fairly steady. In the telephone group, Ericssons are 45s. 9d. ex dividend and Automatic Telephones have advanced 1s., to 75s. 6d., on dividend hopes.

Miscellaneous Movements

E.M.I. have hardened to 25s. 3d., but other radio shares are easier, with E. K. Coles 2s. down at 24s., and Deccas half-a-crown lower at 53s. 9d. De la Rue 5s. shares are quoted at 60s. ex rights to the new shares, and show a yield of 3¾ per cent on the last dividend. Tube Investments have lost a further 7s. 6d. to 6[illegible]. Among transport stocks, B.E.T. deferred again fell 20 points, to 1185. Thomas Tilling at 55s. and Westinghouse Brake at 68s. 6d. are down by 6d. and a florin respectively. At 50s., Calcutta Trams show a loss of 3s. 6d. The two Cable & Wireless stocks moved in opposite directions, the preference being 2½ up at 126, while the ordinary at 154½ are 3 points lower.

Cossor Distributions

In their recent interim report, A. C. Cossor proposed that, as a result of the profit on the sale of certain assets, a capital bonus would accompany the final dividend. Doubts about the substance of this payment have since been resolved by a further statement giving the figure as 7 per cent, free of tax. In the dull conditions of the industrial market, the shares have eased further to 31s. 3d., but they have regained a steadier appearance after their erratic behaviour at the time of the interim report and its initial misinterpretation.

Newcomers

Dealings began last week in the 1s. ordinary shares of the Aerialite Company, manufacturers of cables and wire for the electrical and other industries. Placed in the market at 14s. 3d., the shares, after changing hands up to 15s., went back to 14s. 6d. For the year ended last June, a dividend of 55 per cent was paid. In the particulars published as a preliminary to the market introduction, the directors anticipate that for the present year, profits will expand, barring unforeseen difficulties, to cover a total distribution of 100 per cent on the £24,710 ordinary capital. In making this estimate, consideration has been given to the trading results for the first half of the year, to fuel allocations, and to other current factors. The indicated yield on the shares at 14s. 6d. is £6 18s. per cent, assuming 100 per cent dividend.

Plessey Capital

One result of the recent printing restrictions was the introduction of a number of issues to the market by the procedure of "placing," as opposed to offers for sale to the public or to shareholders. The Plessey Company's issue of 710,000 4½ per cent second preference shares came to the market in the former way. The shares are currently quoted at around the placing price of 21s. 3d., at which the yield works out at £4 4s. 9d. per cent. They rank after the existing 250,000 5½ per cent preference shares. According to the company's statement, the two classes of preference capital are together covered two-and-a-half times by net assets, and the combined dividend requirements five-and-a-half times by last year's profits. The object of the new capital is to finance the increase of productive capacity and the development of fresh products.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1*s. each*) *may be obtained from the Patent Office*, 25, *Southampton Buildings, London, W.C.*2.

A. A. BERNARD.—" Welding electrode holders." 13907. July 20th, 1944. (585937.)

Birmingham Electric Furnaces, Ltd., and A. G. E. Robiette.—" Decarburization of iron or iron alloy castings." 19526. November 22nd, 1943. (585921.)

A. D. Blumlein.—" Push-pull amplifiers, for use, for example, in apparatus for determining the direction or position of reflectors of radiant energy." 29285. November 3rd, 1939. (585906.) " Methods of and apparatus for modifying recurrent signals and applications thereof." 31445. December 4th, 1939. (585908.)

A. D. Blumlein and E. L. C. White.—" Methods and apparatus for reducing the effect of interference in the observation of recurrent oscillatory signals." 31241. December 1st. 1939. (585907.)

D. Blumlein (legal representative of A. D. Blumlein), W. H. Connell and D. G. Holloway.—" Self-balancing bridge arrangements." 14981. November 21st, 1941. (585789.)

British Thomson-Houston Co., Ltd.—" Gaseous electric discharge devices." 14200/44. December 26th, 1942. (585960.)

British Thomson-Houston Co., Ltd. (General Electric Co.).—" Directional antennae." 8848. May 9th, 1944. (585871.) " Methods of rendering materials waterproof or water-repellant." 19733. November 25th, 1943. (585947.)

Chloride Electrical Storage Co., Ltd. (H. P. Murphy).—" Liquid level indicating devices." 24320. December 5th, 1944. (585902.)

E. K. Cole, Ltd., and J. J. P. Hanaway.—" Holder for tubular electric lamps." 24747. December 11th, 1944. (585855.)

B. Edson.—" Snap-action electric switches." 19441. October 10th, 1944. (585972.)

E. A. H. French.—" Circuits for high-pressure mercury-vapour lamps." 7485. April 21st, 1944. (585866.)

General Electric Co., Ltd., W. B. H. Lord, L. Rollin, G. M. Tomlin and H. C. Turner.—" Electric relay and/or controlling systems for controlling the release and/or detonation of projectiles." 10153. June 11th, 1940. (585911.)

W. T. Henley's Telegraph Works Co., Ltd., P. Dunsheath and W. C. Barry.—" Electric cables." 213. January 4th, 1940. (585786.)

D. G. Holloway.—" Self-balancing electrical bridges." 16662. December 25th, 1941. (585790.)

G. Keinath.—" Electrical measuring systems." 8060/43. April 24th, 1942. (585800.)

Marconi's Wireless Telegraph Co., Ltd., M. El Shishini and M. A. H. El said.—" Electrical device for effecting the multiplication or division of independent quantities." 13855. July 19th, 1944. (585936.)

Metropolitan-Vickers Electrical Co., Ltd., and L. Massey.—" Lubricating materials." 4102. March 12th, 1943. (585946.)

Metropolitan-Vickers Electrical Co., Ltd., and D. M. Smith.—" Regenerative gas turbine plant." 14148. July 24th, 1944. (585959.)

Metropolitan-Vickers Electrical Co., Ltd., G. J. Scoles and C. W. Miller.—" Calibration of cathode-ray oscillographs." 12005. September 18th, 1941. (585912.)

Mullard Radio Valve Co., Ltd., and C. F. M. Hayes.—" Apparatus for generating mechanical vibrations." 5290. March 21st, 1944. (585928.)

H. Muller.—" Variable electric transformers, chokes, or the like." Cognate applications 5241/44 and 25695/44. March 21st, 1944. (585927.)

Naamlooze Vennootschap Fabriek van Electrische Apparaten Voorheen F. Hazemeijer & Co.—" Electric switchgear structures incorporating isolating switches." 13042/41. October 25th, 1940. (585788.)

Omes, Ltd., and G. Mora.—" Electrical forging machines." 7361. April 20th, 1944. (585822.)

Omes, Ltd., and C. Rogati.—" Electrical forging machines." 7362. April 20th, 1944. (585823.)

A. F. Pieper.—" Electric lighting means." 21867/44. April 10th, 1944. (585976.)

Pirelli-General Cable Works, Ltd., C. W. Buckles and A. McAulay.—" Electrical insulating materials." Cognate applications, 21609/43 and 3016/44. December 24th, 1943. (585812.)

Plessey Co., Ltd.—" Vibrator circuit." 14460/44. July 29th, 1943. (585882.)

E. H. Robinson.—" Dynamo-electric torque amplifiers." 15019. August 8th, 1944. (585883.)

G. F. Shotter and E. W. Hill.—" Alternating-current electrical load indicating instruments." 9711. May 19th, 1944. (585832.)

Standard Telephones & Cables, Ltd., and C. H. Foulkes.—" Metal-to-glass seals particularly for vacuum tubes." 9264. July 3rd, 1942. (585915.)

Standard Telephones & Cables, Ltd. (trading as Stanelco Products), and J. Handley.—" Electrode soldering and like tools." 7548. April 24th, 1944. (585867.) " Electric soldering tools." 15573. August 15th, 1944. (585884.)

Standard Telephones & Cables, Ltd., and M. M. Levy.—" Detection of obstacles by

means of electromagnetic impulses." 3296. March 11th, 1941. (585826.) "Demodulation of time-modulated electrical pulses." 8798. June 1st, 1943. (585827.)

Standard Telephones & Cables, Ltd., and C. N. Smyth.—"Supports for electron discharge devices." 16437. December 19th, 1941. (585914.)

Standard Telephones & Cables, Ltd., and J. K. Webb.—"Electric cables." 25756. December 22nd, 1944. (585861.)

Standard Telephones & Cables, Ltd., E. M. S. McWhirter and R. H. Dunn.—"Optical projection systems suitable for use with printing machines such as telegraph printing machines." 8334. May 3rd, 1944. (585868.)

Telegraph Condenser Co., Ltd., P. A. Sporing and C. P. Johnson.—"Manipulation of wire." 25321. December 18th, 1944. (585858.)

Telegraph Construction and Maintenance Co., Ltd., and J. N. Dean.—"Adhesive tape." 10564. June 1st, 1944. (585934.)

F. Tench (Automatic Electric Laboratories, Inc.).—"Electric switches particularly for radio receivers." 24346. December 6th, 1944. (585851.)

Westinghouse Brake & Signal Co., Ltd. (Union Switch & Signal Co.).—"Electrical control apparatus." 17901. October 29th, 1943. (585805.)

E. L. C. White.—"Oscillographic methods and apparatus for the observation and or measurement of recurrent signals." 1754. January 29th, 1940. (585909.) "Apparatus for the reception of recurrent pulses of electrical oscillations." 5027. March 18, 1940. (585910.)

H. Clayton-Wright.—"Battery terminal oiler." 17031. September 6th, 1944. (585971.)

The Heat Pump

Operation and Costs

IN a paper presented to the Institution of Mechanical Engineers on March 28th, MR. J. A. SUMNER gave particulars of the experimental heat pump used for heating a large block of municipal buildings in Norwich, which the author believes to be the first large unit to be installed for this kind of duty in Great Britain.

After setting out the principles on which the working of the reversed heat cycle is based and their application in the present case (which were discussed in an article by the author in the *Electrical Review* of May 3rd, 1946) Mr. Sumner referred to the differences between its efficiencies as a refrigerator and as a heat pump, the former being required to *abstract* the greatest amount of heat from a cold body for a given expenditure of mechanical work, whereas the latter had to *deliver* it at a high temperature. The term "coefficient of performance," $\frac{T2}{T1-T2}$, ought, he suggested, to be restricted to refrigeration and "reciprocal thermal efficiency," $\frac{T1}{T1-T2}$, should be employed to assess the heat-pump efficiency.

The steel and reinforced concrete frame building, brick filled, is of 500,000 cu ft capacity. The heating system, comprising wall radiators, embedded panel heaters and (originally) "unit" heaters and fans, was designed for a flow temperature of 180 to 160 deg F. Tests in 1940–41 showed that to maintain 62·5 deg in offices and 60·0 deg in workshops on the coldest days, the short-time maximum flow temperature, with the unit fans out of use, was 130 deg F but that 120 deg would suffice for the greater part of the season.

Coal-fired boilers alone were used from 1940 to October, 1945, when the heat pump was put into commission. Low-grade heat was obtained from the River Wensum which had a minimum flow of 30 million gal. per day. A new two-stage compressor was provided last December and had given considerably improved performance over the earlier second-hand machine, which in 1945–46 had an average seasonal efficiency of 3·75.

Tests have furnished the following figures of costs during the heating season, during which the average maximum demand was 5 therms with 8 therms as a peak. The price of coal (½-in. crushed nuts of 12,000 B.Th.U. per lb) was 65s. per ton and the thermal efficiency of combustion was 55 per cent, giving £440 as the annual cost of fuel. The tariff for electricity was £4 per kVA (without thermal storage) and 0·75 per kWh, giving an annual cost of £601 without and £367 with thermal storage. The average seasonal reciprocal efficiency was taken as 4·0.

Capital Charges

Annual capital charges were: For coal-fired boilers, £225 (15 per cent of £1,500); for heat pump without thermal storage, £210 (7 per cent of £3,000); for heat pump with thermal storage, £245 (7 per cent of £3,500). For the coal-fired boilers cost of attendance (including coal and ash handling) amounting to £230 and of repairs and maintenance to £150 had to be added, giving a total of £1,045, which worked out at 12·5d. per therm. For the heat pump, repairs and maintenance came to £50 plus £25 for replenishing the refrigerant, making the total £978, or 11·7d. per therm, without thermal storage, and £769, or 9·2d. per therm, with thermal storage. For each useful therm provided by the heat pump, 9·1 lb of low-grade coal was burned at the power station compared with 16·6 lb of coal of much better quality needed for the local boilers.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Bradford.—April 22nd. Corporation. Three-phase static transformers. (March 21st.)

Two 350-kW glass bulb type mercury arc rectifiers. (March 21st.)

Cleethorpes.—April 30th. Electricity Department.—L.v. cables. (March 28th.)

Hartford. — May 10th. Corporation. Additional lighting points in council houses. (See this issue).

Edinburgh. — April 25th. City Council. Control and indication equipment at Portobello station. (March 28th.)

Epsom and Ewell.—April 14th. Electricity Department. H.v. and l.v. cable. (See this issue.)

Erith.—April 14th. Electricity Department. Materials and apparatus for the period ending March 31st, 1948. (March 21st.)

Gloucester.—June 4th. Town Council. Two borehole pumps and two horizontal surface pumps, all electrically driven, for the Ketford pumping station modernization. C. J. Scudamore, Water Engineer, 21, Eastgate Street.

Heston and Isleworth.—April 14th. Electricity Department. One 500-kW rectifier equipment. (March 21st.)

Heywood.—April 21st. Electricity Department. One 5,000-kVA transformer and 5,000 yd of 11-kV cable. (March 28th.)

Madras.—May 1st. Government Electricity Department. Interconnector and auxiliary transformers for Basin Bridge "B" power station. (March 28th.)

Manchester.—April 14th. Electricity Committee. Extensions to fire extinguishing equipment and annual requirements of cable supplies, service cut-outs and service units for domestic consumers. (March 28th.)

April 21st. Meters and street lighting lanterns. (See this issue.)

Midhurst.—May 12th. Rural Council. Two sets of electrically driven borehole pumps, for Lodsworth water supply. John Taylor & Sons, Artillery House, Westminster, London, S.W.1.

Newark.—April 21st. Corporation. 11-kV ring main unit and l.v. switchboard. (March 21st.)

Newcastle-under-Lyme.—April 29th. Electricity Department. One 500-kVA rectifier with transformer, substation switchgear and transformers. (See this issue.)

Plymouth.—April 12th. Electricity Supply Department.—L.v. distribution boards. (March 28th.)

Rhondda.—April 26th. Electricity Department. Materials for the year ending March 31st, 1948. (March 28th.)

Ross and Cromarty (South-West District).—April 19th. Electrical contractors are invited to submit their names to the County Architect, Old Academy, Dingwall, if they wish to tender for electrical installations in schools and schoolhouses, housing schemes, etc., in the county.

Sale.—May 5th. Electricity Department. Cables and transformers. (See this issue.)

Salford.—April 16th. Electricity Department. Electrical installations in sixteen bungalows and 172 houses. (See this issue.)

May 3rd." Metalclad switchgear, transformers, cable and neutral earthing resistances. (March 28th.)

Wallasey.—April 14th. Corporation. Annual contract for mains cables. (March 28th.)

Orders Placed

Cardiff.—Electricity Committee. Accepted. Oil immersed transformers (£2,412).—South Wales Switchgear. Earthing resistor (£240).—G.E.C. Battery charging equipment (£866, plus £59 for erection).—McWhirter & Co. Switchboard extension (£3,146).—Metropolitan-Vickers.

Glasgow.—Transport Committee. Accepted. Cables (£17,834).—Scottish Cables. Lead storage battery.—Chloride Electrical Storage Co. Electrodes.—Quasi Arc Co.; Murex Welding Processes; Invicta Electrodes.

Hammersmith.—Electricity Committee. Accepted. Cables. Rubber insulated (£5,735).—Sloan Electrical Co. E.h.v., h.v. and l.v. (£43,391).—Henley's. L.v. (£336).—Pirelli-General. Fluorescent lighting fittings (£762).—G.E.C.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Alfreton.—Factory, Somercotes (£30,000); Cellular Clothing Co., Ltd., Vernon Road, Old Basford, Nottingham.

Barrow-on-Soar.—Grammar school extensions (£15,000); Leicestershire county architect.

Bebington.—Permanent houses (50), Brackenwood scheme; borough surveyor, Brackenwood, Higher Bebington, Wirral.

Bedford.—Houses (74), Cardington estate (£87,123); Lowe & Sons, Ltd.

Beeston and Stapleford.—Houses (62), Ingham Nook Lane; G. C. Hardy, U.D.C. surveyor, Town Hall, Beeston.

Birkenhead.—Infants' school, Bedford Drive, and extensions Overchurch school; Willink & Dod, architects.

Brighouse.—Houses (100), Stoney Lane; borough surveyor.

Burgess Hill.—Houses (64), West Park (£76,211), for U.D.C.; Saunders (Contractors), Ltd., London Road, Burgess Hill, Sussex.

Bushey.—Houses and flats (100) for South Midlands & Greater London Housing Society (£109,829); C. P. Butcher & Co., Ltd., contractors, London.

Camberwell.—Blocks of flats, Summer estate (£365,700); L.C.C. architect.

Cardiff.—Houses (58), Rumney, for T.C.; Demolition & Construction Co., Ltd., 3, St. James's Square, London, S.W.1.

Conisborough.—Houses (54), Conanby; U.D.C. surveyor, Council Offices.

Daventry.—New pumping station and plant (£8,000) at Monksmoor; A. J. Paxman, Moot Hall, borough surveyor.

Derbyshire.—Extensions, Lady Manners Grammar School, Bakewell (£56,000); J. Harrison, county architect, St. Mary's Gate, Derby.

Ealing.—Primary school (£44,986); Limpus & Sons, Ltd.

Essex.—Schools, Brentwood (£8,250), Clacton (£53,500), Hornchurch (£68,500) and Romford (£107,000); county architect, Chelmsford.

Fife.—Houses (40) for County Police Committee; county architect, County Buildings, Cupar.

Garstang.—Residential school, Levens Lodge estate (£120,000); Lancs county architect.

Gateshead.—Factory, Team Valley estate, for North East Wires, Ltd.; W. Hall, Ltd., Derwentwater Road, Gateshead.

Glasgow.—Alterations, Cathcart Police station; city engineer.

Hackney.—Flats (90), Warwick Grove (£139,735); James Stewart & Sons, Ltd., 174, West Green Road, Tottenham.

Harrow.—Primary school, Roxeth Grange (£80,845); Y. J. Lovell & Son, Ltd.

Hereford.—Houses (50), Hunderton estate (£65,360); Wilson Lovatt & Sons, Ltd., Clarence Street, Wolverhampton.

Hornsey.—Flats (96), and six maisonettes, Connaught and Carlton Roads; J. H. Melville Richards, borough engineer, Crouch End, N.8.

Hucknall.—Permanent houses (74), Ruffs Farm estate, second stage; surveyor, Urban Council Offices, Watnall Road.

Irvine (Ayrshire).—Engineers' and joiners' shop for Ayrshire Dockyard Co. (£9,000); manager.

Kilmarnock.—Factory; Saxone Shoe Co., Ltd.

Lancashire.—Police houses (26), Wardle, Littleborough, Ramsbottom, Chadderton and Swinton; G. N. Hill, county architect, County Offices, Preston.

Leicester.—Art school, Wigston Lane (£13,210); city architect.

London.—Extensions, Hampton and Fortis Green works (£496,000); Metropolitan Water Board.

Extensions, Water Board offices, New River Head (£18,947); Higgs & Hill, Ltd.

Ludlow.—Houses (50), Sandpits Lane, for T.C.; S. N. Shrimpton & Son, Council's architects, Knighton, Radnorshire.

March.—Warehouse, High Street, for Bodger Bros.; T. F. Parker, architect.

Margate.—Houses (32), and two blocks of flats, Church Street; W. L. Armstrong, borough engineer, 40, Grosvenor Place.

Midhurst.—Biology laboratory, art room, classrooms, etc., at Grammar School; F. R. Steele, county architect, County Hall, Chichester.

Motherwell.—Greyhound racing track and sports stadium, Parkneuk, Milton Street (£60,000); P. Reid, 638, Merry Street, Motherwell.

Newcastle-on-Tyne.—Additions to the Throat, Nose & Ear Hospital, Rye Hill; S. Miller, Ltd., builders, 17, North Street, Newcastle.

Northwich.—Model village with houses, shops, schools, etc., between Lostock and Wincham; U.D.C. surveyor, Council House, Northwich, Cheshire.

Penryn.—Houses (51), Tremouth; borough surveyor.

Poole.—Cinema and shops, Blandford Road, Hamworthy, for South Coast Theatres Ltd.; Councillor G. Bravery, managing director.

Rainford.—Houses (110) off Church Road; U.D.C. surveyor, Rainford, nr. St. Helens.

Salisbury.—Regional offices; Ministry of National Insurance.

Seaham.—Houses (104), Stewart Street, New Seaham; A. M. Smith, U.D.C. surveyor, Cliff House, Seaham.

Sunderland.—Secondary modern school at Thorney Close for E.C.; T. H. Rae, quantity surveyor, 5, Belford Terrace, Sunderland.

Swansea.—Schools at Cadle (£33,200) and Penlan (£45,000); borough architect.

Studio, Alexandra Road (£5,000); B.B.C.

Trowbridge.—Houses (48), Shalls Lane (£56,924), for U.D.C.; E. J. G. Morgan, Ltd., builders, Uxbridge.

Ware.—Houses (122), Vineyard estate; U.D.C. surveyor, The Priory, Ware, Herts.